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FROM

State board of health,
New Hampshire

16 May, 1901.

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REPORT

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SIXTEENTH REPORT

(THIRD BIENNIAL)

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF NEW HAMPSHIRE

FOR THE TWO YEARS ENDING NOVEMBER 1, 1900.

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STATE OF NEW HAMPSHIRE.

OFFICE OF THE STATE BOARD OF HEALTH,
STATE HOUSE, November 1, 1900.

To His Excellency the Governor and the Honorable Council:

I have the honor to present herewith the sixteenth report of the State Board of Health.

Respectfully submitted.

Irving A. Watson

Secretary.

97418

MEMBERS.

Gov. FRANK W. ROLLINS . . .	Concord.
ATT'Y-GEN. E. G. EASTMAN . . .	Exeter.
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IRVING A. WATSON, M. D., *Secretary* .	Concord.

REPORT.

THE STATE BOARD OF HEALTH.

The State Board of Health was organized and began work in 1881, there being at that time no state sanitary authority of any kind, but few local boards of health, and no intelligent or concerted action for the prevention and restriction of disease, and, except in some of the cities, little or no attention was given to sanitary matters.

Since that time there has been established, through the efforts of the State Board of Health, a local board of health in every town in the state, consisting of three persons, one appointed annually and each member having a tenure of office of three years, thus constituting practically a continuous board. These boards, with very few exceptions, are now doing most excellent work for their respective communities. Rules and regulations for the prevention and restriction of contagious and infectious diseases have been adopted and put in force, and the mortality from some of these diseases has been reduced to a very marked extent.

The advantages of good drinking-water, and the dangers of a polluted source, especially of surface wells, have been made apparent, and public water supplies from unquestioned sources have been urged upon and introduced into many towns and villages that formerly did not recognize the importance of such measures.

From time to time additional powers have been conferred upon the board by the legislature. In 1899 authority was given it to establish rules and regulations for the protection of public water supplies, upon petition of certain interested parties. Under this law regulations have been promulgated

during the past year for the protection of the purity of the waters of Lake Massabesic and Lake Sunapee.

At the same session a law was enacted giving the board authority to regulate the practice of embalming, and, also, to establish rules and regulations for the transportation of the dead,—all of which have been put into successful operation.

The ventilation of many public and private buildings, schoolhouses, and private dwellings has been greatly improved.

A very complete system of registration of births, marriages, and deaths has been established, the latter being the only index to what has been accomplished by public sanitation. The great reduction in the death rate of pulmonary tuberculosis must be credited largely, if not entirely, to sanitary measures, which have been brought about by the dissemination of information pertaining to this disease. The diminution of our death rate from typhoid fever, diphtheria, scarlet fever, and some other diseases is due largely to the excellent work done by our local boards of health.

Frequent inspections of the penal institutions, county almshouses, insane asylums, etc., are made by the board, and under its recommendations great improvement has been made from time to time in the condition of the almshouses and asylums throughout the state, as well as of some other institutions.

The board has ever been critically watchful of the summer-resort interests of the state, believing that not only should the health of our summer visitors be jealously guarded, but that upon this point large financial interests are at stake. Therefore the most careful precautions are taken to keep our summer-resort localities free from contagious and infectious diseases, and in the event of the appearance of such a case most rigid measures are employed, to the extent, in more than one instance, of conducting this work with absolute secrecy. As an illustration of this point, during the past summer a case of smallpox appeared at one of the very largest summer resorts in the state, where hundreds of summer visitors were sojourning, and this case was taken care of to

recovery and the premises disinfected, all without the least danger to any of the guests, and with absolute secrecy, without which large financial losses would have resulted.

These, in brief, are some of the benefits derived directly or indirectly from the State Board of Health.

BOARD OF COMMISSIONERS OF LUNACY.

In 1889 the State Board of Health was made, by legislative action, a board of commissioners of lunacy, with certain duties and authority relative to the management of the insane. Chief among these was the power to commit indigent insane persons, in whom there was a reasonable probability of benefit, to the New Hampshire Asylum for the Insane for remedial treatment.

The law also provides that all commitments, discharges, and deaths at the state and county asylums and almshouses, as well as other places where insane persons are detained, shall be reported to the board, and that the board shall make inspections of these institutions.

While this law costs the state approximately sixteen thousand dollars a year and entails much work upon the board, the results emphasize the wisdom of the legislature in its enactment. Since its passage the board has committed to the New Hampshire Asylum for the Insane, for remedial treatment, five hundred and seventy-nine insane persons. Of this number one hundred and sixty-four, or approximately 29 per cent, have been discharged cured; one hundred and sixty-two, or about 18 per cent, have been discharged improved; one hundred and sixty-eight have been discharged as incurable and are now otherwise provided for; fifty have died; and the remainder are still receiving remedial treatment at the expense of the state at the asylum. The large number who have recovered or improved would seem to be ample justification for the care the state is giving this unfortunate class of patients.

VITAL STATISTICS.

The State Board of Health has charge of the vital statistics of the state. A return of all births, marriages, and

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State Board of health,
New Hampshire

16 May, 1901.

PROTECTION OF WATER SUPPLIES.

The board has given considerable attention to this subject since the last report was rendered. It will be seen that nearly forty pages of the secretary's report, pages 1 to 37, inclusive, are devoted to this topic, including the enactments of the last legislature giving the State Board of Health power to establish rules and regulations for the protection of public water supplies, and also other laws relating to the same subject.

This question has a vital bearing upon the public health of the state, as well as upon our summer-resort interests.

Rules and regulations for the protection of the waters of Lake Massabesic and of Lake Sunapee were established by the board during the year 1899; a careful investigation of the pollution of Ammonoosuc river, in connection with the public health of Littleton, Woodsville, and the summer-resort localities further north, was made, a detailed account of which appears within the pages referred to.

THE SANITARY BULLETIN.

Since January, 1899, the State Board of Health has issued a sanitary bulletin quarterly, for the instruction of local boards of health and the people of the state in general in regard to practical sanitary matters. The first issue was devoted largely to the restriction and prevention of tuberculosis; the second to the restriction and pervention of scarlet fever; No. 3, to summer diseases of children, smallpox, vaccination, measles, etc.; No. 4, a special issue on smallpox and vaccination; No. 5, on typhoid fever, state care of tuberculous patients, etc.

These bulletins, which consist of about twelve pages, octavo size, are sent gratuitously to each member of the local boards of health, to town clerks, and to numerous citizens in every town in the state, and to any person within the state who applies for it. The issues range from three thousand to five thousand copies each, and are entered at the Concord post-office as second-class matter, thus saving a large postage.

We believe that the Sanitary Bulletin has been the source for the diffusion of a great deal of knowledge relative to the restriction and prevention of the communicable diseases, hygiene, and sanitation.

COUNTY ALMSHOUSES AND ASYLUMS.

More or less improvement has been made at most of the county almshouses and asylums during the past two years,— that is, a sufficient outlay has been made to keep them in a fairly good condition, at least, such as the laying of new floors, painting walls, etc., etc.

The greatest improvement has been made at the Merrimack county almshouse, where the capacity of the asylum has been doubled by the erection of a large brick addition, and many other changes, to the extent of several thousands of dollars.

Upon the whole the almshouses of the state may be said to be in good condition. Two counties, at least, Belknap and Sullivan, labor under the disadvantage of having from time to time made additions to the original farm buildings, with the result that neither establishment is so constructed or situated as to constitute a first-class almshouse.

Belknap county is lamentably deficient in suitable accommodations for its insane.

It is not our purpose in this report to review in detail the condition of these institutions. The attention of the county delegation will, at the proper time, be called to whatever serious defects may exist, and recommendations made for improvements.

During the past fifteen years there has been a great change in the condition of our county institutions, and a vast improvement has been made in that time. New buildings have been erected, old ones greatly improved, and today, barring a very few exceptions, our county almshouses and asylums are in excellent condition.

SMALLPOX.

Smallpox was reported in the city of Manchester on June 4, 1900. Subsequently it appeared in Pittsfield, Chichester,

Danbury, Hooksett, and Portsmouth, with one case in another locality which was kept secret for reasons deemed to be for the public interests, and which was successfully taken care of without exposing others. From the date of its first appearance in this state to the present time (December 4, 1900) there have been some seventy cases in all, most of them of a very mild type, a few severe. It is believed that two deaths in children were due to this disease, before its true character was discovered. Owing to the mild form in which the malady appeared it was, in a few cases, diagnosed as chicken-pox, hence there were numerous exposures. Some other cases were not reported by the families in which they occurred, and there were exposures from these sources.

It is only through the most efficient work by the health authorities that the disease has not become epidemic.

At this writing there are but four known cases of smallpox in the state, and those are in the smallpox hospital in the city of Manchester.

For a more complete history of the outbreak see page 127 *et seq.*

STATE HYGIENE, INCLUDING RAILROADS, SUMMER RESORTS, HOTELS, ETC.

Under this head a report is made by Dr. Granville P. Conn, president of the State Board of Health (see page 152), in which he discusses the importance of hygiene to the state, and especially to the summer-resort interests. The board has given a great deal of attention to this matter, not only in the interests of public health, but also for the financial benefit of New Hampshire. A most watchful care is maintained over the sanitary condition of our summer-resort localities, plumbing of houses, drainage, and certain other conditions essential to the best interests of these places. Especial care is taken that no infectious or contagious disease shall gain a foothold in these localities, and if, perchance, a case is imported it is immediately isolated and every precaution taken to protect others from infection.

The proprietors of our summer-resort hotels have large financial interests at stake, and they know that the advent of a case of typhoid fever, diphtheria, scarlet fever, or other communicable disease would mean the emptying of their hotels within a few hours, and the reputation of their houses injured to an extent that might take years to overcome, therefore any suggestion in the line of sanitary improvement is always welcome by them and almost invariably adopted.

It is gratifying to be able to announce that the railroads of the state continue to improve their stations, yards, etc., and that today there is a better condition than ever before in the history of the state. Within a few years a large number of old stations with unsanitary fixtures have been demolished and new ones have been built; others have been repaired and put in good condition; grounds have been beautified and made more attractive,—all of which exert an influence for public good.

SCARLET FEVER AND CORRESPONDENCE RELATING THERETO.

A pamphlet on the restriction and prevention of scarlet fever (see page 38), the last issue of which is a revised edition of similar papers heretofore published, has been widely circulated throughout the state, copies having been placed in the hands of local boards of health for distribution. The result of this work is evident in the mortality returns. For the year 1899 there were but twenty deaths from scarlet fever in the state of New Hampshire. This is doubtless due largely to the efficient work of local boards of health, coupled with a better understanding of the nature of the disease by the public and the enforcement of isolation and disinfection.

This department has had considerable correspondence relative to various questions that have arisen in connection with the enforcement of the rules and regulations for the restriction of this disease. Many points have been raised, as will be seen by reference to the correspondence given in the report (see page 56 *et seq.*). The attention of health officers is particularly called to these letters, for the reason that they contain a great deal of information concerning details, applicable

to the handling of this disease; questions concerning quarantine, period of isolation, disinfection, kind of disinfectants, how disinfection should be done, compensation for services, closing of schools, duties of health officers, when quarantine may be raised, etc., etc.

REGULATING THE PRACTICE OF EMBALMING.

The law passed at the last session of the legislature, relating to the registration and examination of embalmers, and the establishment of rules and regulations for the preparation and transportation of dead bodies, has been put into successful and satisfactory operation, with results of a most salutary kind. The board has received the hearty co-operation of the embalmers of the state, of the transportation companies, and of the public in this work. Methods are now in force which insure the safe transportation of dead bodies to almost unlimited points,—indeed, bodies of persons dead of diphtheria, scarlet fever, and some of the other communicable diseases are now shipped without danger to the public, and without the least objection on the part of transportation companies, a condition absolutely impossible prior to the enforcement of the law referred to. For further information concerning the operation of this law, together with the rules and regulations adopted, reference may be made to page 86 *et seq.*

THE EXAMINATION OF PLUMBERS, PLUMBING, AND HOUSE DRAINAGE.

The legislature of 1899 enacted a law authorizing the examination of plumbers, and the regulation of the practice of plumbing and house drainage. This law was made compulsory in the cities, and optional in the towns of the state. It provides for the registration of plumbers who were in business in this state when the law was passed, and for the examination of all others who desire to enter that business.

Considerable work has been done to secure uniformity of action in the several cities of the state, and to carry out the

provisions of the law in a manner that shall be of public utility and protection against the evils of poor plumbing.

This law has been put into successful operation in the cities of Manchester, Concord, Portsmouth, Keene, Laconia, and Somersworth. It is partially in force in Nashua, and is not in force in Dover, Berlin, Franklin, and Rochester. It is probable that these latter cities will proceed to carry out the provisions of the law, which is admitted on all sides to be of importance.

PULMONARY TUBERCULOSIS.

A remarkable reduction has been made in the death rate from tuberculosis (consumption) in the last fifteen years. For figures showing this reduction reference may be had to page 185 of this report.

For the year 1899, 582 deaths were reported from this cause, a smaller number than ever before returned in a single year. The average number of deaths from this disease for the past fifteen years has been 728 annually.

A diminution in the mortality from tuberculosis has followed in all those states which have an efficient sanitary administration. Notwithstanding this, there must necessarily be a limit beyond which public education and the general sanitary work of local boards of health cannot be carried without other means than those now available.

With the indisputable proof that consumption is a disease that may be prevented, and that also may be cured, the time has arrived when the subject should receive the careful consideration of our legislators. The experience of the past few years, not only in the United States, but also in the countries of Europe, as well as in Japan and elsewhere, has demonstrated the great success of the sanatorium plan of treatment for tuberculosis, and it is also further proven that locality is a matter of minor importance. In other words, it is not improbable that consumptives could be as successfully treated in New Hampshire, or any of the New England or middle states, as in Colorado or any other part of the great West. To the wealthy this is not of so much importance, but to

those in moderate circumstances, or indigent, the subject assumes an entirely different aspect. The latter classes are deprived of any means of securing a change of climate, or of obtaining treatment at any of the sanatoria now established, and it is among these two classes that the great majority of our cases of tuberculosis exist. It is, therefore, of great importance that some move be inaugurated that will, sooner or later, lead to the establishment of a sanatorium in New Hampshire, for the treatment of consumptives.

To this end we would recommend that, if nothing more is done, the legislature authorize some commission, or other competent board, to investigate as fully as may be the sanatorium method of caring for and treating consumptives, together with results accomplished, cost, etc., and to make a detailed report of such investigations, with recommendations, to the legislature of 1903.

Certainly the state should not do less in this important matter.

SPECIAL PAPERS.

Incorporated in this report are three or four special papers relating to important sanitary topics. Robert Fletcher, Ph. D., civil engineer, and member of the State Board of Health, has contributed an important paper on "The Economical Disposal of Sewage with Purification by Small Communities." An abridgment of this paper was published in the April (1900) number of the New Hampshire Sanitary Bulletin, and it received special notice from the ablest sanitary authorities of this country and Europe, and was re-published in England.

Two papers on the general subject of School Hygiene, one by Dr. John H. Leal of Rochester, and the other by Dr. D. E. Sullivan of Concord, which were read before the New Hampshire Association of Boards of Health, are also given, as well as a brief report by the secretary on Farm Sanitation, Some Notes on the Causes of Death in New Hampshire (see page 182), and some comments on twenty of the most prominent causes of death in the state, together with illustrative diagrams.

SECRETARY'S REPORT.

PROTECTION OF WATER SUPPLIES.

Probably there is no subject pertaining to the health of a community more vital than that of securing a suitable water supply and protecting it from contamination.

Extensive experiments and scientific investigation within a few years have revealed the dangers to human life that are liable to occur from the use of a polluted drinking-water. It is known from sad experience that a single case of typhoid fever may infect the water supply of a city to the extent of causing hundreds of cases of this disease. Outbreaks of typhoid fever have so frequently been traced to infected drinking-water that this is now regarded as the most prolific source of the disease. This has been the chief factor in promoting the introduction of public water supplies, not only in our cities, but also in many smaller communities of the state.

Hundreds and thousands of wells formerly in use have been abandoned, and a public water supply substituted, largely in the interests of public health. Most marked results have followed the introduction of these public water supplies in some of our villages, chiefly in the almost entire suppression of typhoid fever.

Not only have these changes resulted in the great diminution of the disease alluded to, but in many other ways have these communities been benefited thereby.

It is only recently, comparatively speaking, that action along the lines of procuring better water supplies, or protecting existing ones, has been encouraged by legislative enactment. We have now liberal and wise laws enacted for the purpose of protecting the purity of water and ice supplies.

The two following sections from chapter 108 of the Public Statutes, the first enacted in 1885 and the second in 1887, are substantially the first enactments of any importance relating to this subject:

SECT. 13. If a person shall place, leave, or cause to be placed or left, in or near a lake, pond, reservoir, or stream tributary thereto, from which the water supply for domestic purposes of a city, town, or village is taken, in whole or in part, any substance or fluid that may cause the water thereof to become impure or unfit for such purposes, he shall be fined not exceeding twenty dollars, or be imprisoned not exceeding thirty days, or both.

SECT. 17. Whenever any well, spring, or other water supply is suspected of being polluted by sewage or other matter dangerous to health, the health officers of the town where it is located may cause an analysis of its water to be made by a competent chemist, without expense to the owner. If the analysis shows the water to be unfit for drinking purposes, they may, with the approval of the State Board of Health, prohibit its use, and, if it be from a well, may cause the well to be closed. The State Board of Health shall authorize such investigations whenever deemed necessary for the public good.

It is proper to state that under the last section quoted a great deal of work has been done by the state and local boards of health. Hundreds, and perhaps thousands, of analyses of wells and other sources of water supplies have been made since the enactment of the law, and have resulted in the closing of many wells that were polluted to a dangerous degree.

Formerly somewhat extensive investigations along these lines were made by the State Board of Health, and many analyses were made. The present law, however, provides that this work may be done by local boards of health. In connection with this subject we wish to emphasize the great necessity for the establishment of a state laboratory for analytical work, not only for determining the quality of our drinking-waters, which in itself is of the utmost importance to the welfare of the people of the state, but also for the investigation of diseases, fraudulent food supplies now sold in our markets, etc., etc.

In 1895, chiefly through the efforts of the water commissioners of our cities, realizing the importance of better protection, the legislature enacted the following law:

AN ACT TO PROTECT WATERS USED FOR DOMESTIC PURPOSES.

(Chapter 76, Pamphlet Laws, 1895.)

SECTION 1. Whoever knowingly and willfully poisons, defiles, pollutes, or in any way corrupts the waters or ice of any well, spring, brook, lake, pond, river, or reservoir, used as the source of a public water or ice supply for domestic purposes, or knowingly corrupts the sources of the water of any water company or of any city or town supplying its inhabitants with water, or the tributaries of said sources of supply, in such a manner as to affect the purity of the water or ice so supplied at the point where the water or ice is taken for such domestic use, or puts the carcass of any dead animal or other offensive material into said waters or upon the ice thereof, shall be punished by a fine not exceeding one thousand dollars, or by imprisonment not exceeding one year. The provisions of this section shall not apply to the deposit of any bark, sawdust, or any other waste of any kind arising from the business of cutting, hauling, driving, or storing logs, or the manufacture of lumber; and the use of any stream for the purposes of manufacturing and for the necessary drainage connected therewith, if more than four miles distant from the point where the water is taken for such domestic purposes, shall not be deemed a violation of this section.

SECT. 2. No person shall cut or take ice from any lake, pond, or reservoir used as the source of a public water or ice supply for domestic purposes for man, unless he first shall comply in all respects with such reasonable rules and regulations in regard to the manner and place of cutting and taking such ice on said lake, pond, or reservoir as may be prescribed by the local board of control or officers of a water company who may have charge of the works of any city or town supplying its inhabitants with water from said lake, pond, or reservoir. The supreme court shall have power to issue injunctions restraining any person from cutting or taking ice from such lakes, ponds, or reservoirs until they have complied with the reasonable regulations made as aforesaid.

SECT. 3. Said local boards and officers may also make all reasonable rules and regulations in regard to fishing and the use of boats in and upon any such lake, pond, or reservoir, and in regard to racing or speeding horses upon the ice thereof, which

they may deem expedient. Any person who shall violate any of said rules and regulations after notice thereof shall be fined not exceeding twenty dollars, or imprisoned not exceeding six months.

SECT. 4. If any person shall bathe in such lake, pond, or reservoir within one fourth mile of the point where said water is taken, he shall be fined not exceeding twenty dollars, or imprisoned not exceeding six months.

SECT. 5. Whoever shall willfully injure any of the property of any water company or of any city or town, used by it in supplying water to its inhabitants, shall be punished by a fine not exceeding one thousand dollars, or by imprisonment not exceeding one year; and such person shall also forfeit and pay to such water company, city, or town, three times the amount of actual damages sustained, to be recovered in an action on the case.

SECT. 6. All acts and parts of acts inconsistent with this act are hereby repealed, but nothing in this act shall be construed to repeal any special act applying to cities and towns.

SECT. 7. Ths act shall take effect upon its passage.

[Approved March 28, 1895.]

The above law is of great importance, and is probably sufficiently stringent and explicit to meet, in most cases, the purposes for which it was enacted. It was found, however, not to cover certain conditions that presented themselves in connection with one or two of our largest sources of supply, particularly where the watershed of a given supply was located in two or more towns, the difficulty being to secure between towns uniform regulations that could be enforced alike in the different towns or municipalities. Therefore the legislature of 1899 enacted the following:

AN ACT FOR THE BETTER PROTECTION OF PUBLIC WATER SUPPLIES.

(Chapter 57, Laws of 1899.)

SECTION 1. Whenever any board of water commissioners, local board of health, or ten or more citizens of any town or city have reason to believe that a public water or ice supply is being contaminated or is in danger of contamination, and that the local regulations are not sufficient or effective to prevent such pollution, they may petition the State Board of Health to investigate the case and to establish such regulations as the said board may deem necessary for the protection of the said supply against

any pollution that in its judgment would endanger the public health.

SECT. 2. The State Board of Health shall, after due investigation, make such regulations as it may deem best to protect the said supply against any dangerous contamination, and the regulations so made shall be in force when a copy is filed with the town clerk and posted in two or more public places in said town, or published in some newspaper in the county, and it shall be the duty of the local board of health to enforce said regulations.

SECT. 3. Any person violating any regulation established by the State Board of Health shall be punished by a fine of twenty dollars for each offense, and a certified copy under oath of such regulation, made by the secretary of the State Board of Health, or by the town clerk where the regulations are filed, shall be received as *prima facie* evidence of the existence of such regulations in any court of the state.

[Approved March 9, 1899.]

The first case to be considered under the provisions of the foregoing law was presented in the following communication:

OFFICE OF BOARD OF HEALTH,

MANCHESTER, N. H., May 19, 1899.

To the State Board of Health:

We, the undersigned, members of and constituting the board of health of the city of Manchester, most respectfully request that your honorable board make, establish, and promulgate a code of rules to protect and preserve the purity of the waters of Lake Massabesic, in the city of Manchester and the town of Auburn, the same being the reservoir from which the city of Manchester obtains its water supply for domestic uses.

Respectfully submitted.

(Signed) JOHN C. BICKFORD,
WILLIAM K. ROBBINS,
WILLIAM M. PARSONS,
Board of Health of City of Manchester.

In presenting this matter at a meeting of the State Board of Health, it was stated that this subject was of great importance to the people of Manchester, inasmuch as Lake Massabesic furnished drinking-water for that city, with a

population of nearly 60,000; that upon the shores of this lake were numerous cottages and summer hotels; that there was more or less boating; and that on Sundays, in particular, several steamers plied the lake with a large number of passengers—in fine, that there were numerous and many sources of possible pollution that should be under control.

After a careful consideration of the entire question by personal investigation of the shores of the lake, and with the approval of the board of health of the city of Manchester and the town of Auburn, the following regulations were adopted, copies posted in the city of Manchester and the town of Auburn, and all the requirements necessary to put them in legal force complied with:

THE STATE OF NEW HAMPSHIRE.

Whereas, A legal petition having been presented to the State Board of Health, asking for the establishment of regulations to protect the purity of the water of Lake Massabesic, under the law approved March 9, 1899, entitled "An act for the better protection of public water supplies," the following regulations are promulgated:

REGULATIONS OF THE STATE BOARD OF HEALTH FOR THE PROTECTION OF THE PURITY OF THE WATER OF LAKE MASSABESIC IN THE CITY OF MANCHESTER AND THE TOWN OF AUBURN.

1. No privy, pigpen, stable, or other building or structure in which horses, cattle, swine, or other animals or fowls are kept, shall be built, continued, or maintained within seventy-five feet of Massabesic lake (meaning high-water mark), or within seventy-five feet of any bay, cove, or inlet thereto, or within seventy-five feet of any stream tributary to said lake, bays, coves, or inlets, except in such cases as the joint boards of health of the city of Manchester and the town of Auburn may permit, and under such regulations as they may require.

2. No sink water, urine, or water that has been used for washing or cleansing either materials, person, or food, shall be allowed to run into said lake, or into any bay, cove, or inlet thereof, or into any stream tributary thereto, or into any excavation or cesspool in the ground or on the surface of any ground within one hundred feet of said lake (meaning high-water mark), or of any bay, cove, or inlet, or within

one hundred feet of any stream tributary thereto, except by consent, and under such regulations and conditions as may be given by the joint boards of health of the city of Manchester and the town of Auburn.

3. No dead animal, or fish, or parts thereof, or food, or any article perishable or decayable, and no dung either human or animal, kitchen waste, swill, or garbage shall be thrown into or deposited in said lake, or left or permitted to remain within seventy-five feet thereof (meaning high-water mark), or into any bay, cove, or inlet of said lake, or into any stream tributary thereto, or within seventy-five feet of such bay, cove, or inlet, stream, or tributary.

4. No sawdust shall be thrown or be allowed to fall into said lake, or into any stream tributary thereto.

5. No person shall bathe or swim in said lake.

6. No boat, either for public or private use, nor boat-house or other construction for use to float, steam, or sail upon said lake, shall have, keep, or maintain a ship-closet, urinal, or other construction of easement which shall permit excrement or other offal to fall or empty into said lake. All boats carrying passengers shall be provided with water-tight tanks or receptacles which shall be kept in a sanitary condition satisfactory to the joint boards of health before mentioned; and the contents thereof shall be disposed of at least one hundred feet from the shore of said lake (meaning high-water mark), and one hundred feet from any bay, cove, or inlet of said lake, or any stream tributary thereto, and in such manner as may be directed by the boards of health of the city of Manchester and the town of Auburn.

7. No matter, waste, or materials such as are described in sections 2, 3, and 4 shall be thrown, deposited, or allowed to remain upon the ice of the waters of said lake, or upon that of any bay, cove, or inlet thereof, or of any stream tributary thereto.

8. No person, firm, or corporation shall cut and take ice from said lake in quantities of more than ten tons, except by permission, and under the direction of the joint boards of health of the city of Manchester and the town of Auburn.

9. No cattle, horses, or other animals, used either for teaming, riding, or speeding, shall be driven, guided, or speeded upon the ice of said lake, except by permission of and under such regulations as the joint boards of health before mentioned shall prescribe.

10. It is the duty of the local board of health to enforce the above regulations, and any person violating any regulation

established by the State Board of Health shall be punished by a fine of twenty dollars ($20.00) for each offense.

I hereby certify that the foregoing rules and regulations were adopted at a special meeting of the State Board of Health held at the state house, Concord, this eighth day of June, 1899.

IRVING A. WATSON,
Secretary.

Protection of Sunapee Lake.

The next matter taken up at the meeting of the board above referred to was a petition from citizens of Sunapee, members of the Sunapee Lake Water Company, stating that in their belief the water and ice supplies of Sunapee lake were being contaminated, and in danger of further contamination, and respectfully asking the State Board of Health for better protection. The situation was reported to be substantially as follows: That a small corporation is supplying water from Sunapee lake to a portion of Sunapee village, the intake being but a short distance above the gate which is the outlet into Sugar river; that the water of Sunapee Harbor, in particular, is being polluted, and the lake generally, and is in danger of further pollution by drainage from houses situated on the shores near to the water's edge, and particularly by steamboats which are provided with open water-closets, the wharves being but a short distance from the intake, thus becoming a special source of danger to the petitioners. Following is a copy of the petition:

Sunapee, N. H., May 9, 1899.

To the State Board of Health, Concord, N. H.:

We, the undersigned, members of the Lake Sunapee Water Supply Company, believing that the water and ice supply in Sunapee lake is being contaminated and is in danger of fur-

ther contamination, respectfully petition your honorable board for better protection.

(Signed) LEWIS H. GOSS,
Pres., Director, Treasurer.
IRVING G. ROWELL, *Director.*
SOLON W. ABBOTT, *Director.*
NATHAN A. SMITH.
GEORGE H. BARTLETT.
LUCY J. RUNALS.
F. A. YOUNG.
J. P. SMITH,
JOHN YOUNG,
E. L. YOUNG,
E. C. FISHER,
C. Q. MUZZEY,
ERNEST R. MUZZEY.
J. Z. BARTLETT.
JENNETTE R. EASTMAN.
A. D. FELCH, *Clerk.*

It was also shown to the board that Sunapee lake has become a great summer resort. There are many cottages along its shores, and likely to be more; that a large amount of money is invested in real estate adjacent to the lake by parties living outside of the state, as well as by our own citizens, all of whom desire that the waters of the lake shall be protected against contamination as far as possible, inasmuch as the lake is the source of drinking-water for nearly all of the summer visitors.

Both state and local interests demand this protection. The board considered that the question was of such magnitude that a careful investigation of local conditions must be made; certain interested parties be given the right of a hearing, and all the factors bearing upon the matter be taken into consideration before final action by the board. The case was, therefore, continued to the next meeting of the board, in the meantime an investigation of the local conditions to be made.

On July 18, 1899, the State Board of Health held a meeting at Sunapee, at which were present Dr. Granville P. Conn, Dr. C. S. Collins, Prof. Robert Fletcher, C. E., and the secretary; also, by invitation, Dr. John D. Quackenbos.

The object of the meeting was to examine as far as possible and to consider the sanitary conditions pertaining to Sunapee lake, together with their bearing upon the petition presented to the board under date of May 9, preceding.

Nearly all the day was spent upon a steamer, following the coast line of the lake chiefly, stopping at a few points. It was the expressed opinion of every member of the board present that some regulations were necessary, not only for the protection of the water takers at Sunapee village, but also in the interests of the owners of the numerous cottages and other summer resorts around the lake.

At a meeting of the board held September 29, 1899, after a careful consideration of the question of the protection of the water and ice supplies of Sunapee lake, the following regulations were unanimously adopted by the board:

THE STATE OF NEW HAMPSHIRE.

Whereas, A legal petition having been presented to the State Board of Health, asking for the establishment of regulations to protect the purity of the water of Lake Sunapee, under the law approved March 9, 1899, entitled, "An act for the better protection of public water supplies," the following regulations are promulgated:

REGULATIONS OF THE STATE BOARD OF HEALTH FOR THE PROTECTION OF THE PURITY OF THE WATER OF LAKE SUNAPEE, IN THE TOWNS OF NEWBURY, SUNAPEE, AND NEW LONDON.

1. No privy, pigpen, stable, or other building or structure in which horses, cattle, swine, or other animals or fowls are kept, shall be built, continued, or maintained within seventy-five feet of Lake Sunapee (meaning high-water mark), or within seventy-five feet of any bay, cove, or inlet thereto, or within seventy-five feet of any stream tributary to said lake, bays, coves, or inlets, except in such cases as the local board

of health may permit, upon the approval of the State Board of Health, and under such regulations as they may require.

2. No sink water, urine, or water that has been used for washing or cleansing either materials, person, or food, shall be allowed to run into said lake, or into any bay, cove, or inlet thereof, or into any stream tributary thereto, or into any excavation or cesspool in the ground or on the surface of any ground within seventy-five feet of said lake (meaning high-water mark), or of any bay, cove, or inlet, or within seventy-five feet of any stream tributary thereto, except by consent, and under such regulations and conditions as may be given by the local board of health, upon approval of the State Board of Health.

3. No dead animal, or fish, or parts thereof, or food, or any article perishable or decayable, and no dung either human or animal, kitchen waste, swill, or garbage shall be thrown into or deposited in said lake, or left or permitted to remain within seventy-five feet thereof (meaning high-water mark), or into any bay, cove, or inlet of said lake, or into any stream tributary thereto, or within seventy-five feet of such bay, cove, or inlet, stream, or tributary.

4. No sawdust shall be thrown or be allowed to fall into said lake, or into any stream tributary thereto.

5. No person shall bathe in said lake within one fourth mile of where water is taken for a public supply, or within like distance to any private intake pipe, provided notice to that effect is conspicuously posted in the vicinity.

6. No boat, either for public or private use, nor boat-house or other construction for use to float, steam, or sail upon said lake, shall have, keep, or maintain a ship-closet, urinal, or other construction of easement which shall permit excrement or other offal to fall or empty into said lake. All boats carrying passengers shall be provided with water-tight tanks or receptacles which shall be kept in a good sanitary condition, and the contents thereof shall be disposed of at least one hundred feet from the shore of said lake (meaning high-water mark), and one hundred feet from any bay, cove, or inlet of said lake, or any stream tributary thereto, and in such manner as shall be satisfactory to the health authorities before mentioned.

7. No matter, waste, or materials such as are described in sections 2, 3, and 4 shall be thrown, deposited, or allowed to remain upon the ice of the waters of said lake, or upon that of any bay, cove, or inlet thereof, or of any stream tributary thereto.

8. It is the duty of the local board of health to enforce the above regulations, and any person violating any regulation established by the State Board of Health shall be punished by a fine of twenty dollars ($20.00) for each offense.

9. All of the foregoing rules, excepting No. 6, will take effect and be in force on and after November 1, 1899. Rule No. 6 will take effect and be in force on and after June 1, 1900. Any deviations from the above rules must be by written consent of the State Board of Health.

I hereby certify that the foregoing rules and regulations were adopted at a special meeting of the State Board of Health, held at the state house, Concord, this twenty-eighth day of September, 1899.

IRVING A. WATSON,
Secretary.

It will be seen that the foregoing rules and regulations are substantially the same as those for the protection of Lake Massabesic.

The regulations relating to Massabesic and Sunapee lakes have been entered on the records of the State Board of Health, copies placed on file with the clerks of the several towns bordering on the two lakes, two or more copies posted in each town, copies filed in the police courts of the city of Manchester and the town of Auburn, and hundreds of printed copies distributed to the cottagers and real estate owners in both localities, so that the law relating to the adoption and promulgation of these regulations has been strictly complied with. The results accomplished by these regulations will be reported elsewhere.

The Ammonoosuc River, Sewerage of Bethlehem, etc.

The Ammonoosuc river is the chief stream of the western and southern slopes of the White Mountains region. Its source is at the very summit of the divide at the head of the White Mountain Notch, within a few rods of the Crawford House, the waters of one slope forming the river named, and of the other the Saco river, which flows easterly through the Notch, thence into the state of Maine.

Numerous small streams, from different sources in the mountain region, swell this rivulet, so that even before it reaches the Fabyan House it is known as the Ammonoosuc river. Numerous streams farther down are added, so that from Bethlehem Hollow to its mouth it constitutes a river of respectable size, with valuable water powers.

In connection with this stream questions of considerable importance to the health of the people, and to the general welfare of the state with respect to our summer resort interests, have arisen. These questions will be more clearly revealed and better understood by a perusal of the following communications, together with a report upon the condition of the river, made after a careful and thorough investigation:

BETHLEHEM, N. H., June 6, 1899.

Hon. Irving A. Watson, Secretary State Board of Health:

DEAR SIR,—I am one of our village precinct commissioners, also one of board of health. Our sewerage here does not suit us, and the only way we see to do is to carry it from its present terminus to the river [Ammonoosuc]. We should have to extend it, as we have surveyed it, say one mile and two hundred feet; of course it is a splendid grade. It would enter the river west of Bethlehem Hollow, between there and Wing Road. What is your opinion about putting it in the river? All the towns around here do the same. We have a precinct meeting called for Thursday, 2 P. M., this week, June 8, to take action upon it. All here are united that it is the best course to pursue. Cannot you, on receipt of this tomorrow afternoon, drop me a line or two, stating what your idea about it is? If you write so as to get it in the north mail Wednesday evening, we can get it Thursday noon, before our meeting. Our sewerage has got to be attended to, and now seems to be the time to take hold of it.

Truly yours,

(Signed) BENJAMIN TUCKER.

STATE BOARD OF HEALTH,

CONCORD, June 7, 1899.

Benjamin Tucker, Village Precinct Commissioner, Member Board of Health, Bethlehem, N. H.:

DEAR SIR,—Your favor of June 6 is just at hand, but in order to get this communication into your hands prior to the precinct meeting it will be impossible to discuss the questions which have the greatest legal and sanitary bearing upon the matter under consideration.

I would suggest that at the meeting which is called for tomorrow you act independently of anything I may say, leaving the matter to the judgment of the precinct commissioners, or to such gentlemen as may be chosen, as to whether the sewer should be built or not.

There are some legal questions which would naturally have to be settled before beginning the work. You would not wish to expend a large amount of money in the construction of the sewer, and then be enjoined from using it by the courts. I apprehend that the Littleton Water Company might give you some trouble, and that certain questions would arise that would have to be settled by the courts.

Littleton and Woodsville both take their public water supply from the Ammonoosuc river, and the situation is already serious enough, and will soon have to receive further consideration.

If the river is to be made the receptacle for the sewage of all the towns along its course, Littleton and Woodsville will be compelled to obtain water from some other source, else a filter plant would have to be constructed, either of which plan would entail considerable expense. If these towns are not willing to make the change, they might, perhaps, maintain a successful suit against the towns that pollute the water of the river. It is a long-recognized principle of the courts that riparian owners are entitled to water in its natural purity, as far as may be, and therefore the pollution of streams, by sewage or otherwise, is not recognized by the courts as allowable.

The State Board of Health cannot advise you to construct the proposed sewer for the reasons already stated; at the same time it is possible that any objection to such a course might be satisfactorily settled so as to give Bethlehem its desired connection with the river without jeopardizing public health interests.

One thing may be considered certain, and that is that the water supply of Littleton must not be endangered by pouring the sewage of Bethlehem into it.

I think I have said enough to show you that there are several questions to be considered in connection with this proposition, and that they should be carefully weighed and settled before the proposed sewer is constructed. Such a sewer would without doubt be a great public benefit to Bethlehem.

Very truly yours,
IRVING A. WATSON,
Secretary.

BETHLEHEM, N. H., June 12, 1899.

Hon. Irving A. Watson, Secretary State Board of Health:

DEAR SIR,—Yours to me of the 7th inst. was duly received, and was read at our precinct meeting last Thursday. The following vote was passed unanimously: "That it is the sentiment of the meeting that the sewage be carried to the Ammonoosuc river." The meeting was adjourned for one week, until Thursday this week. We have got to have sewerage, and different from what we now have,—I mean the outlet. I think we shall build toward the river. The distance is, say, 360 rods; perhaps build one half of it this year, if we can make any arrangement with owners of the land to let it run on the land; it will be swamp land most likely where we should stop. In yours of 7th inst. you say, "But in order to get this communication into your hands prior to the precinct meeting, it will be impossible to discuss the questions which have the greatest legal and sanitary bearing upon the matter under consideration." Is there anything you can inform us about that we can use at our adjourned meeting? Is there anything in the few lines I have quoted from your letter? We want to get all the points we can, and of course wish to do what is right, but the only way we can see to give an outlet to our sewage is by going to the river.

Thanking you for yours of the 7th inst., I remain,
Respectfully yours,
(Signed) BENJAMIN TUCKER,
One of Village Precinct Commissioners.

STATE BOARD OF HEALTH,

CONCORD, N. H., June 13, 1899.

Benjamin Tucker, Village Precinct Commissioner, Bethlehem, N. H.:

DEAR SIR,—I am in receipt of your favor of June 12, in which you inform this board of the action taken at your recent precinct meeting, showing that the sentiment of the precinct is in favor of carrying the sewers to the Ammonoosuc river; and that the meeting was adjourned for one week, at which time I presume you intend to consider the matter further.

In my former letter I briefly suggested the possible difficulties that stand in the way of your carrying out the proposed plan. Since then we have received information that leads us to believe that Littleton interests will resort to legal measures, if necessary, to prevent the discharge of Bethlehem's sewage into the said river. In view of this fact it is not necessary at this time to discuss the question from a sanitary standpoint, but simply the legal side of it.

The water of the Ammonoosuc river is taken for a public water supply at Littleton, therefore, under the Public Statutes, as well as under a great number of decisions in common law, that town had a right to the water in its natural purity, and no corporation or individual has a right to pollute it. As long as Littleton objects to the discharge of sewage into the river, Bethlehem must take care of its sewage in some other manner. It would be impossible, under the circumstances, to connect with the river. The courts would doubtless grant a permanent injunction against such action. The fact that other towns sewer into the river illegally does not give your town license to do so; neither does the fact that it would be more convenient and also improve the sanitary condition of your town to carry your sewer to the river have any legal bearing in the case, for there are other successful methods of sewage disposal.

If Littleton and Woodsville were willing to obtain their water from some other source, it is likely that there would be no objection on the part of any one to your carrying the sewage of Bethlehem to the river; but under the present circumstances, with objections raised on the part of these two localities, there is no way in which it can be done. On the other hand, it is not among the improbabilities that in the near future some localities that are now sewering into

the river may have to resort to some other means of sewage disposal.

We feel absolutely certain of the action the courts would take in respect to your proposed plan; and so far as this board is concerned, if a legal petition were presented to us from Littleton, asking for the protection of its water supply, we should be compelled, under the Public Statutes, to prohibit your town from discharging its sewers into the said river.

This letter is simply advisory, based on our knowledge of the Statutes in such cases, the numerous decisions under common law, and precedents governing like situations, and we would recommend your precinct, if it is not satisfied as to the legal difficulties which confront you, to postpone any further action in this direction until you have had an opportunity to investigate the soundness of the advice given you.

I think there are some other methods of sewage disposal worthy your consideration, and which may be carried out successfully and with reasonable expense, without jeopardizing the rights of others.

We commend your honest desire to improve the sanitary condition of Bethlehem, and should be glad at any time to assist you to the extent of our powers in solving this somewhat perplexing and difficult problem.

Very truly yours,
IRVING A. WATSON,
Secretary.

The foregoing correspondence explains in part the situation at Bethlehem with respect to its sewer system. It may be here stated that the village of Bethlehem receives, annually, several thousands of summer visitors, and as a summer resort is noted for its salubrity; has clean streets, good water, and is well sewered, the only serious question being in connection with the discharge of the main sewer.

At the time the foregoing correspondence took place, the sewer discharged its contents in a pasture, quite a long distance from the village; but this having created a nuisance, it was thought necessary to extend the sewer, the object being to reach the Ammonoosuc river. This plan was not carried out, however. The sewer was extended a little, and there the work stopped. The sewage is discharged on the surface of the ground in a somewhat wet or swampy locality, and

will, probably, before a very long period, create a nuisance that will demand further consideration.

POLLUTION OF THE RIVER.

In the autumn of 1898 it was incidentally reported to the board that there were, or had been, quite a number of cases of typhoid fever in Littleton. Upon this subject the secretary addressed one of the leading physicians of that town, asking him for information concerning the matter. The following communications explain themselves:

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., November 19, 1898.

G. W. McGregor, M. D., Littleton, N. H.:

MY DEAR DOCTOR,—Incidentally it has been reported to this board that there is, or has been, quite an outbreak of typhoid fever in Littleton. Will you kindly inform me if such is the case? And if so, to what do you attribute the infection? Any particulars that you may be able to furnish will be thankfully received.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

LITTLETON, November 21, 1898.

Dr. I. A. Watson, Secretary State Board of Health, Concord, N. H.:

DEAR DOCTOR,—Your inquiry as to the probable origin of the unusual number of cases of typhoid fever in this town is pertinent. There have been, approximately, fifteen cases in Littleton, including three that occurred in the early summer. The only thing that they all had in common was water. This is obtained largely from the Ammonoosuc river, without filtering.

Presumably this river receives the sewage from the Mt. Pleasant House, Fabyan House, the White Mountain House, the Twin Mountain House, and from Bethlehem, whose sewers open (or empty) into a swamp below the town, which is drained by a brook into the river above the intake of our water system.

The storage reservoir is situated on Oak Hill, where it receives a partial supply by gravity from the hills above. But the past summer the pump has been kept busy most of the time, pumping this river water, which is used by most of the inhabitants for domestic purposes.

If the premises of this reply, as to the river's being the sluice for the hotel sewers, are correct, then the answer to your question seems simple. I believe it will bear investigation by the State Board of Health. Our local board of health consists entirely of laymen. Some time ago they gave permission to one of the physicians to have the water analyzed. I saw the physician today and urged him to have the analysis made. He said he would attend to it today. I shall be pleased to report the same to you when received.

Yours very truly,

(Signed) G. W. McGREGOR.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., November 23, 1898.

George W. McGregor, M. D., Littleton, N. H.:

MY DEAR DOCTOR,—I am in receipt of your favor of November 21, in relation to typhoid fever in Littleton. Please accept my thanks for the information which you have given me. We would be glad to know more of the details of the outbreak, to wit: How many houses have been, or are, infected? How many of these received water from the public water supply? Are the houses scattered, or are they confined chiefly to one locality? We should be glad to receive, at the earliest possible moment, a copy of the analysis which you have had made of the water.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

LITTLETON, November 27, 1898.

Dr. I. A. Watson, Secretary State Board of Health, Concord, N. H.:

DEAR DOCTOR,—Yours of the 23d inst. is received, and in answer to your several questions I can state that there were, approximately, fifteen cases of typhoid fever in town, no house having more than a single case, and all widely distributed over the village.

I believe that every infected house is supplied with water from the public system, obtained as described in my previous letter to you.

. . . . . .

Whether a water analysis would reveal the typhoid bacillus now, I have doubt, as the river banks have been washed clean, probably, by the fall rains and the resultant high water, and the hotels being closed, there has been no sewage emptying into the Ammonoosuc river since the first of September.

However, if you deem it of sufficient importance, I will carry out your wishes or instructions in the matter. I think I mentioned in my former letter that our board of health is composed wholly of laymen. In the early summer I had three cases of typhoid fever, and in the second and third notification I urged the importance of a water analysis, which was procured, and reported as "a very good drinking-water." But of course no attempt was made to find the bacillus; and even if it had been attempted, it might have failed, for the simple reason that the water might have been taken from a faucet leading directly from the hill supply, which is pure spring water.

. . . . . .

If I can be of further service to you, command me.

Very truly yours,

(Signed) G. W. McGREGOR.

The lateness of the season and the fact that substantially all the larger sources of danger to the river were closed for the winter, the matter was not further considered until the following spring and summer, when a careful investigation was made of the entire situation.

The outbreak of typhoid fever at Woodsville in March, 1899, caused the inauguration of as careful an investigation as possible of the existing conditions. In this work we desire to acknowledge the assistance given by various physicians and health officers, and particularly by the boards of health of Littleton and Woodsville. Among the physicians of Littleton who were especially active in assisting the secretary should be mentioned Dr. G. F. Abbott of that town.

The results of the various examinations and continued investigations were made public in the following report, made by the State Board of Health on September 28, 1899, to

the boards of health of Littleton and Woodsville, and to the water companies of the two localities:

Report on Typhoid Fever and the Pollution of Ammonoosuc River.

Between the 29th day of March and the 8th day of April, 1899, there occurred fourteen cases of typhoid fever in the village of Woodsville, of which four proved fatal. The sudden outbreak, with no previous cases in the town, was sufficiently alarming in itself to attract the immediate attention of the health authorities, and therefore a careful and studied investigation was made to discover the source of infection.

The cases were located in different sections of the town, with only one case at any given house, and with no local unsanitary conditions sufficient to account for the outbreak. In fact, the sanitary conditions were as good as the average in the community.

There are in Woodsville two sewer systems, one trapped, the other open. Some of the infected houses were connected with one system, others with the other, while some were not connected with either system.

The milk supply for these families was obtained from at least six different sources,—in fact, all common avenues of infection were eliminated, with the single exception of the public water supply. In this connection it may be stated that during the preceding year, 1898, fifteen cases of typhoid fever were reported from Woodsville to the State Board of Health, and one in January, 1899. In previous years there has been more or less of this disease, and for a long time the public water supply has been under suspicion to the extent that many families have been supplied regularly with spring water for drinking purposes.

The present public water supply was installed by the Woodsville Aqueduct Company in 1885, the water being taken directly from Ammonoosuc river at a point close to the village of Woodsville. No attempt was made to filter the water other than to strain out the coarser floating material.

The water is forced into the service pipes by a pump operated by water power, automatically controlled so as to maintain an approximately even pressure upon the pipes, thus giving sufficient force for hydrant purposes, with, of course, an abundance of water.

OPINIONS OF PHYSICIANS.

On the morning of April 11, the secretary of the State Board of Health, in company with Mr. A. H. Leighton, health officer of Woodsville, visited every physician in the place. Dr. O. D. Eastman stated that he had five well-marked cases of typhoid fever; that no case was reported until the characteristic eruption had appeared, so that there could be no question about the diagnosis. He was very strongly of the belief that the pollution of Ammonoosuc river was the source of the typhoid outbreak at Woodsville.

Dr. I. N. Eastman had one well-marked case of typhoid fever, his own wife, who subsequently died of the disease. He suspected that the public water supply was infected.

Dr. C. R. Gibson had two well-marked cases of typhoid fever, and he entertained the same views regarding its origin.

Dr. E. M. Miller also had two cases, and believed that the present outbreak was caused by a polluted public water supply.

Of the fourteen persons infected, all but one used the public water supply, and it is not certain that that one did not occasionally make use of it. Even though water from another source is provided for drinking purposes, it is scarcely probable that that scrupulous care can be maintained in any household sufficient to guard a family against an infected water supply that is used for every purpose except upon the table to drink.

It was further reported that several cases of typhoid fever had occurred in persons who had been at Woodsville for a short time and gone away, one being a teacher who went to Littleton ill with the disease and the other a man who went to the town of Ryegate, Vt., and there died with it. These two were included in the fourteen cases mentioned.

The physicians of Woodsville were unanimously of the opinion that the outbreak could be traced only to a polluted public water supply; that all other ordinary avenues of infection had been eliminated by careful inquiry and investigation.

EXAMINATION OF AMMONOOSUC RIVER.

An examination of the river was next made, to ascertain to what extent it was being polluted by sewage, and, if possible, to trace the points from which the river had become infected with the germs of typhoid fever.

So far as the question of sewage is concerned, a large quantity is poured into the river. It should be remembered that this is a comparatively rapid stream, and that in all probability the germs of typhoid fever might be carried its entire length intact and capable of communicating the disease to persons who might drink of the water.

Independently of the numerous farmhouses that dot its banks or are in close proximity to the river above Woodsville, are villages, hamlets, and public hotels, to wit: Bath, Lisbon, North Lisbon, South Littleton, Littleton, Alder Brook Mills, Wind Road, Bethlehem Hollow, Twin Mountain, Fabyan, Mount Pleasant, and Crawford Houses. The total amount of sewage poured into the river is quite large, and the dejecta of a single case of typhoid fever discharged into the stream at any point in its course, under favorable circumstances, might readily infect the river its entire length below.

At Bath some drainage enters the river, but at Lisbon almost the entire sewage of the town goes directly into the stream. In addition to that, garbage and waste of all kinds are dumped into the river, so that it may be said that substantially all of the sewage, street washings, garbage, and other waste material are discharged or thrown directly into the river.

The same conditions exist at Littleton, and in addition thereto is the discharge from the tannery vats. Not only this, but even dead animals are dumped into the river, and have been observed by numerous witnesses at different points,

particularly at Bath, where workmen have not infrequently seen dead animals of various kinds go over the dam at that place.

Occasionally the pollution of the river becomes so excessive as to attract especial attention, as it did recently, when the tannery vats at Littleton were discharged into the river at a time of unusually low water, and which was reported to this board in the following communication:

LISBON, N. H., September 11, 1899.

Dr. Irving A. Watson, Secretary State Board of Health, Concord, N. H.:

DEAR SIR,—A petition bearing forty or fifty names was sent to the Lisbon board of health, asking us to investigate the condition of affairs which led to the death, in great quantities, of the fish in the river above and below North Lisbon.

Dr. Gibson and myself went to North Lisbon and made inquiry of persons signing the petition, and also followed along the river in that vicinity. We found fish in quantities along the banks and on the bed of the river, apparently destroyed by some poisonous matter thrown into the river. The testimony of Mrs. Barrett, at North Lisbon postoffice, was that Friday morning she was awakened quite early by a continued splashing in the river. She went down to the river and, as she says, saw fish swimming around with their heads out of water. She also says that the water in the river had a blue color and an oily appearance. Later in the day her boy picked up on the shore, in the length of a few rods, a five-peck basketful of dead fish, and it was stated that the banks of the river were covered with them from North Lisbon to Littleton, increasing in quantity toward Littleton; at South Littleton were lots of pickerel. We saw only dace and suckers at North Lisbon.

Friday and Saturday the river gave off a terrible stench, and Sunday morning, when we were there, it was still bad.

I was in doubt as to our place in the matter, so thought to report to you. I understand that about three years since they had a similar experience at North Lisbon. The people think the glove tannery is responsible for this.

Very truly yours,

(Signed) F. N. KINCAID,
For Lisbon Board of Health.

The boards of health of the towns bordering on the river were asked to investigate the condition and the cause of the mortality among the fish in the river. Although all the boards made reports, the following communication explains the situation:

WOODSVILLE, N. H., September 15, 1899.

Dr. Irving A. Watson, Secretary State Board of Health, Concord, N. H.:

DEAR SIR,—Dr. Gibson and I have been up to Littleton and looked over the situation there. We found that the fish were killed by the emptying of the lime vats at the Saranac glove tannery into the river. Mr. Henry F. Green, who is manager of the company, told us that they had been doing this for the last six or seven years at intervals of every six months, but that there had been a larger quantity of water in the river, so that it had never shown in this way before. The acids that are used in their process of tanning come into the river every day when they run the tannery. The hides in the process of tanning are being washed and scraped, and a stream of water running through all the time carries the refuse out into the river.

I will inclose the answers to your questions in this letter.

Very truly yours,

(Signed) A. H. LEIGHTON,
Health Officer.

Immediately following the discovery of the above state of affairs, the board of health of Woodsville issued the following notice:

WARNING!

TO THE INHABITANTS OF WOODSVILLE FIRE DISTRICT.

You are hereby notified not to use the aqueduct water for culinary purposes without first boiling the same, the tannery vats at Littleton having been emptied into the river, causing the fish to die in large quantities, which has so polluted the river as to make it unfit for drinking or other culinary purposes without first being boiled.

(Signed) BOARD OF HEALTH.

There are many other sources of river pollution that might be shown were it necessary to convince any one by further evidence that the river is seriously and dangerously polluted. The discharge of the sewage of Littleton and Lisbon alone is sufficient to condemn the use of this water at Woodsville for drinking purposes. It should be borne in mind that Woodsville and Littleton are the only towns on the river that use this water for a public water supply.

DIRECT CAUSE OF THE OUTBREAK.

A search for typhoid fever cases along the river above Woodsville, from which infection might have taken place in the outbreak alluded to in the beginning of this report, resulted in the discovery of the fact that among the several cases of this disease that occurred at Littleton late in the preceding fall, at least one, situated in the lower part of the town close to the river, sewered directly into the same, and that several other cases occurred in houses connected with the public sewer.

A careful investigation of all the facts bearing upon the outbreak referred to leads us to the belief that the following theory offers a correct solution to the problem: That sewage, containing the germs of typhoid fever from some of the cases at Littleton late in the fall, became frozen and remained so until the first rise of the water in the following spring, some little time before the breaking up of the ice. These germs were liberated and carried down the river, and thus for a brief period infected the stream and consequently the water supply at Woodsville, with the result already known. Upon the liberation and passage of the germs down the river, there being no more to follow, the outbreak was abruptly self-limiting. This seems to be the only explanation that we are able to offer for the appearance of the disease as related.

THE WATER SUPPLY OF LITTLETON.

Several years ago the first attempt was made by a corporation to give Littleton a public water supply, the source

being chiefly, or entirely, springs located at a sufficient elevation above the town to give a gravity pressure ample to meet all demands. A reservoir was excavated for the collection of the water, and for a while this met, in a limited degree, the requirements of the village. The water from this source was of good quality and was entirely free from any danger of sewage contamination or drainage from any dangerous source.

Subsequently it was found that this supply was not equal to the growing demands of the town, and therefore the water corporation undertook to supply the deficiency by establishing a pumping station at the river and forcing water directly into the pipes in such quantity as might be required to eke out their supply. The management conceived the idea of filtering the river water to a certain extent, and for that purpose constructed a well on the bank of the river, some ten feet wide and forty feet long, and so deep that the bottom of it should be below the bed of the river, and covered the same with a roof. The expectation was that this well would always contain a sufficient amount of water to supply the pumps, and that it would be so well filtered that all floating material would be held back, and clean water only would be pumped from this well. The corporation evidently did not recognize the fact that the ten feet, or so, of sand and earth that intervened between the well and the river was not a protective barrier against germ life and would not, therefore, in itself purify the water beyond removing the coarser material floating in it.

This well, however, did not meet expectations. Floating sawdust and other material rendered this narrow filter of earth and gravel so effectually impervious to the passage of water that after a little the well did not furnish a sufficient supply of water. In order to obtain enough water the company laid a pipe directly through this bank into the open river. So ineffectual have been all attempts to filter the water that at times sawdust and other floating debris have been drawn from the faucets in town and have occluded some of the smaller pipes.

THE RIVER ABOVE LITTLETON.

There is a dam in the river just below the point from which the water is pumped, which creates a pond of considerable length, and the bottom of which is chiefly a great mass of sawdust, the accumulation of years. A large part of this sawdust has doubtless come from the Alder Brook Mills, some three or four miles above the town, and the remainder from mills farther up the river. Not only are there great masses of decaying sawdust at the bottom of this pond and along its banks, but there were at the time of inspection, June, 1899, two or three quite large islands of this material only a few rods above the intake.

A careful examination of the river above Littleton was made, with the result that it was ascertained that a large amount of sewage is being deposited in the stream. On both sides of the river, between that town and Bethlehem Hollow, are numerous dwelling-houses, boarding-houses, stables, etc., the waste from which goes directly into the river. The condition at Alder Brook, with its sawmill, boarding-houses, etc., is of itself a constant menace to the purity of the water supply. Farther along, up the river, sewage is received from Wing Road, Bethlehem Hollow, and numerous mountain houses, the last being the Crawford House, at the very headwaters of the river.

At Bethlehem Hollow, some of the boarding-house privies are located directly over the river, and this is not the only place where similar conditions exist. At least the leachings of the sewage of the village of Bethlehem, with its three thousand or more summer boarders, must enter the river, especially in the fall of the year, when the rains are more numerous and after a season's accumulation of sewage on the ground where it is deposited, on a slope inclining toward the river. A portion of Bethlehem is sewered directly into the river, or into a stream tributary to the river, and in this part of the town is included one hotel, with its large number of summer guests. Above Bethlehem we believe all the large summer hotels sewer directly into the river: The Twin Mountain

House, White Mountain House, Fabyan House, Mount Pleasant House, and the Crawford House.

THE AMMONOOSUC RIVER UNFIT FOR A PUBLIC WATER SUPPLY.

It will therefore be seen the Ammonoosuc river constitutes, in fact, a trunk line sewer for the valley and the adjacent slopes, and with the relatively large amount of sewage that goes directly into it, there can be no question, even without further knowledge of facts or conditions, that the water from this river is unsafe for drinking purposes, and is at all times a threatening danger to those who use it. In the light of our present scientific knowledge of public health questions, this assertion is not in the least magnified, and is corroborated beyond controversy by results which have followed similar conditions elsewhere.

In the summer months, during a dry season such as the present, the amount of water flowing in the river is relatively small, and therefore the percentage of sewage is greater than when there is a larger volume of water in the stream, and the only protection afforded to those who use the water lies in the fact that it is not at all times infected with disease-germs. It is true that in this stream, which is of a comparatively rapid nature, sewage is very rapidly disposed of by oxidation, sedimentation, etc., hence it does not exist in noticeable quantities in the water, and perhaps at times would not be detected by a chemical analysis. Nevertheless, this does not afford such protection as one not familiar with bacterial life would expect. Disease germs are living, minute bodies, which may be floated intact for many miles after the sewage itself has disappeared from the water, and be able to communicate disease (typhoid fever, for instance) to persons who drink the water. It is in this way that the water of the river is rendered dangerous to the public health interests of any town using it. To illustrate: A single case of typhoid fever at any point where the discharges would be sewered into the river might produce an epidemic of this disease at Littleton or Woodsville, the only two towns along the river which take this water for public uses.

It is a notable fact that the village of Lisbon, which obtains a water supply from another source, had but one case of typhoid fever during the year, and that was an imported one.

The management of the Fabyan House, which is located almost at the headwaters of the Ammonoosuc, realizing that this stream as a source of water supply was a constant menace to the interests of the house, abandoned the same and obtained water from another source.

Some of the parties directly interested in both the Littleton and the Woodsville water companies, have admitted to this board that they regard the water unfit to drink, do not permit its use in this way in their own families, and have recommended to the public that if it is to be drank it should be boiled.

Typhoid fever is a disease that is most frequently communicated through infected water, and there are many historical instances of epidemics produced in this manner. The one at Lausanne, Switzerland, which was caused by the soakage of water, into which the discharges of a single case of typhoid fever had been thrown, through the ground for a long distance, reappearing in a spring which supplied the town, thereby producing an extensive and very fatal epidemic, is well known in the annals of sanitation. The great epidemic of typhoid fever at Plymouth, Pa., in 1885, which resulted in 1,133 cases and 114 deaths, was caused by the discharges of a single case being emptied into a stream several miles away, the water of which ran through two reservoirs, or artificial ponds, into a third reservoir, from which the water supply of the city was pumped. In 1890 an epidemic of 550 cases of typhoid fever in Lowell, Mass., was traced to the discharges from four typhoid fever patients on a stream, Stony brook, in Chelmsford, some three miles above Lowell and on the opposite side of the Merrimack river.

An almost unlimited number of outbreaks of typhoid fever, which have occurred through water infected in a like manner to those just given, could be cited, but the facts are so well known and have been so positively demonstrated that further testimony of this kind is uncalled for.

Under existing conditions the public water supply of Littleton and Woodsville is liable at any time to be infected in a similar manner, with relatively like results. The nature of the typhoid fever germ is thoroughly understood, and that it may be carried a long distance by water is a demonstrated fact. Many, if not all, of the physicians of Littleton and Woodsville believe that a large proportion of the typhoid fever cases which have prevailed in those towns during the past few years have been due to infection through the water supply. There are many circumstances which point very strongly to this conclusion; but proof of this is not material or necessary to render emphatic the assertion that this river water is unfit for drinking purposes, and that from its use individual cases or an epidemic of typhoid fever is liable, under certain conditions, to be developed at any time.

We have not discussed the question of the degree of pollution at various points along the river, inasmuch as it is a sewage-contaminated stream its entire length; but it is, of course, self-evident that the danger of typhoid fever infection is much greater at Woodsville than at Littleton.

The old-time assertion that polluted water purifies itself in running a short distance, so that it is rendered perfectly safe and healthful, has long since been scientifically disproven, and arguments of this kind simply exhibit ignorance of the subject. True, sewage or other effete material may disappear to the extent that they may not be recognized by sight, taste, or smell, or even by chemical examination, and still the water may be infected with the germs of typhoid fever, and perhaps other disease-producing bacteria.

The State Board of Health of Massachusetts, which has been authorized to expend nearly thirty thousand dollars annually in the investigation of questions pertaining to water supplies, and which has made more careful and extensive experiments than any other scientific body in the world, enunciates in one of its recent reports the following propositions:

1. The insufficiency of the self-purification of streams.
2. The ready conveyance of typhoid fever down a stream by sewage-polluted drinking-water.

3. The practicability of protecting a community against infected drinking-water by natural sand filtration.

THE REMEDY.

In the light of the foregoing statements the remedy is self-evident, to wit: That the use of the river for domestic purposes should be abandoned, or the water be effectually filtered. This view is taken because we cannot see any way by which this stream can be protected from contamination more or less dangerous. To exclude sewage from this river, from its source to its mouth, would require an outlay of several hundred thousand dollars, with unsatisfactory results and only a limited protection. It would, therefore, seem that the only safe and feasible plan is for Woodsville and Littleton to secure drinking-water from some other source, or to construct scientific filtration beds, and to surrender the river to power and drainage purposes. We believe that in the latter capacity the river will be of the greatest public utility and that it will in this way best serve the public health interests of the entire valley through which it runs.

Such recommendations have been made both to the Littleton and the Woodsville water companies, and assurances are given by the representatives of these corporations that an investigation will be made at an early date, with a view to obtaining suitable water.

Until such time as these corporations shall be able to furnish to the public a water that is safe and suitable for drinking purposes, we would recommend to the people of Woodsville and Littleton not to drink the water from Ammonoosuc river until it has been boiled or distilled.

During the summer of 1899, and prior to rendering the foregoing report, the secretary of the State Board of Health discussed this matter and made some of his investigations with the Littleton board of health, which at that time was composed of the following-named citizens: Hon. D. C. Remich, Dr. George F. Abbott, and Mr. Chauncey H. Green. That board was unanimous in the opinion that something must be

done to improve the water supply of the town; that the case should receive the immediate attention of the water company.

Hon. James W. Remick, attorney for the Littleton Water & Light Company, not only in behalf of his client, but also to maintain and promote the public welfare of the town, among other things recommended that the engineer of the company make a thorough investigation of the situation. The communication received by Mr. Remick, in response to his letter, is given below, and not only represents the evident willingness of the company to make such changes as might be deemed desirable, but also shows that the consulting engineer recognized the demands of the health authorities as reasonable:

NEW YORK, September 18, 1899.

James W. Remick, Esq., Littleton, N. H.:

DEAR SIR,—At your request we sent Mr. Edgar L. Street, the consulting engineer of the Littleton Water & Light Company, to Littleton, about two weeks ago, to investigate the water supply, and he has reported to the company as follows:

"Since it is claimed that the Ammonoosuc river now receives sewage from the village of Bethlehem, and since the board of health has on this account declared the method of drawing water from it now practiced by the Littleton Water & Light Company, as liable to result in the use of polluted water by the village of Littleton, I beg to suggest the following solution of the difficulty as the result of my examination on the ground:

"The pump house stands on the bank of the Ammonoosuc river and the pump draws water directly from the river. Surrounding the river is a level field, one side of which forms the bank of the river. The formation of the soil of this field is sand and gravel, and its depth is about twenty-five feet. Under this bed of gravel lies hard rock.

"It was found that the water in the gravel stands at about the same level as the water in the river, when tested about fifty feet from the water's edge.

"This being the case, we have a bed of water-bearing gravel, from which a large supply of thoroughly filtered water may readily be drawn by the usual method of putting down a series of tube-strainer wells to the depth of the rock.

"I see no reason why this device should not secure entire

immunity from any risk of contagion, even if it be possible that any vitality could be left in disease germs after having passed over several miles of Ammonoosuc river bottom."

I wish you would kindly call the attention of the State Board of Health to this report, and ascertain whether they would have any objection to our pursuing this course. Of course, as you know, we must act upon the recommendations of our engineer in this matter, but should prefer that the State Board of Health should approve it before we make this change.

Yours truly,

(Signed) WILLIAM B. HORD.

A short time subsequent to the receipt of the above communication by the local attorney for the company, the following letter was received from its consulting engineer:

NEW YORK, October 4, 1899.

Irving A. Watson, Secretary State Board of Health, Concord, N. H.:

DEAR SIR,—I am engineer for the Littleton Water & Light Company of Littleton, N. H., and I understand your engineer has approved, conditionally, my suggestion for the improvement of the method of drawing water from the Ammonoosuc river, as now practiced.

I should be pleased if you would kindly put me in communication with him, with a view to having a conference on the subject.

Yours truly,

(Signed) EDGAR L. STREET.

In accordance with the above request, an appointment was made, and the locality carefully examined by Edgar L. Street, C. E., consulting engineer of the Littleton Water & Light Company; Robert Fletcher, C. E., engineer to the State Board of Health; and the secretary of the board.

The proposition made by Mr. Street, that four wells be sunk in the gravel, a reasonable distance from the river, as outlined in one of the above quoted letters, was thought to be feasible, and the plan was assented to by all present as worthy of a trial. The representatives of the State Board of Heatlh took the position that the proposed wells would be, to a certain extent, an experiment, and that the company must take

its chances and the total responsibility of procuring a satisfactory water supply by this method; that the State Board of Health, in assenting to a trial of this nature, did not commit itself any further than to place itself on record as being willing that the company should undertake this experiment, and be given a reasonable time in which to demonstrate its success or failure; that in the event of its failure to produce a satisfactory water supply, further demands would necessarily be made upon the corporation. It was understood that the company would carry out the proposed plan at once.

No report having been received during a period of several months, the following communication was addressed to the engineer of the company:

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., July 30, 1900.

Edgar L. Street, 44 Wall Street, New York City:

DEAR SIR,—You will recollect that late last autumn, two representatives of the State Board of Health, Robert Fletcher, C. E., and myself, met you at Littleton to consult in regard to obtaining a better water supply for Littleton, or, in other words, to make some arrangement whereby water would not be pumped directly from the Ammonoosuc river. A plan proposed by yourself, to wit: That wells be dug a certain distance from the river and water pumped therefrom, was agreed upon to the extent that this board, while not committing itself to the extent of assuring a satisfactory supply, believed the experiment to be worthy of trial, and that it offered a great improvement over the conditions then existing.

Up to the present time we have received no report as to what action your company took in the matter. Assuming that you carried out your plans according to the understanding, we would be glad to know the result, in order that we may be able to render a report on the existing conditions at the present time.

Thanking you in advance, I remain,

Very truly yours,

(Signed) IRVING A. WATSON,

Secretary.

Reply:

NEW YORK, September 4, 1900.

Irving A. Watson, Esq., Secretary State Board of Health, Concord, N. H.:

DEAR SIR,—After an absence of some weeks in Europe, I find your letter of July 30 awaiting me, and trust that you will pardon the delay in answering it.

I have my plans well developed for the improvement of the water supply at Littleton, N. H., and hope to complete them during the next sixty days. On account of my absence the matter has been somewhat delayed, but the preliminaries have all been attended to, and there is no reason why an early completion should not be effected.

Yours truly,

(Signed) EDGAR L. STREET.

Thus the matter stands at the time this report goes to press.

With respect to the situation at Woodsville, various plans have been suggested for the introduction of a better water supply: One, on a plan like that contemplated by the Littleton Water & Light Company; another, that the experiment of driven wells be tried adjacent to the Connecticut intervales just below Woodsville; and, lastly, that water be obtained from a pond in Ryegate, Vt., to supply Wells River and Woodsville, conjointly.

The second plan has probably received more serious attention from parties who have given the most consideration to the subject. Thus far we are not informed that any definite action has been agreed upon. In the mean time, a great number of families in Woodsville, mistrusting the river, are using spring water for drinking purposes.

CONTROL OF ICE SUPPLIES.

It is a known fact that not infrequently diseases have been communicated through a contaminated ice supply. It has been demonstrated by conclusive experiments that the germs of disease are not destroyed by freezing. Researches by Vaughan and other investigators have shown that the germs of typhoid fever, a disease more commonly communicated by

infected water than otherwise, are not destroyed by freezing, and that when liberated from their icy environment may readily convey the disease to persons drinking the water. In fact, it is proven that if a body of water is contaminated to the extent that it is rendered unfit for drinking purposes, ice from the same water is likewise unfit for the same use.

The legislature has, therefore, passed a wise law, making it the duty of boards of health to examine and inspect the sources from which ice is taken, and to take such action as may be necessary to protect public health. Following is the text of the law:

AN ACT IN RELATION TO THE TAKING OF ICE.

(Chapter 85, Laws of 1897.)

SECTION 1. It shall be the duty of boards of health of the cities and towns of the state to examine and inspect the sources from which ice is cut, or is proposed to be cut, for domestic use in such cities and towns, and to employ such means as may be necessary to determine whether the waters of such sources of ice supply have been polluted, or whether ice taken therefrom will be deleterious to the public health.

SECT. 2. In each case where the waters of the sources of ice supplies shall be found so polluted that the ice taken therefrom will be unhealthy or unsafe for domestic use, the board of health of the city or town concerned in the same shall immediately notify such person or persons as may have taken, or who propose to take, ice from such polluted source for their own domestic use or for sale for domestic use, of the dangerous character of the waters inspected, and that the taking of such ice for domestic use must cease.

SECT. 3. Whoever knowingly or willfully shall cut or take any ice for domestic purposes from any waters which are polluted with sewage or other substance deleterious or dangerous to life or health, or from waters which a board of health has condemned, shall be fined not exceeding two hundred and fifty dollars, or imprisoned not exceeding six months.

RESTRICTION AND PREVENTION OF SCARLET FEVER.

(SOMETIMES CALLED SCARLATINA, CANKER RASH, SCARLET RASH, RASH FEVER, ETC.)

It is but comparatively few years since scarlet fever was allowed to prevail in New Hampshire, as elsewhere, almost without any attempt at restriction, with a relatively large number of deaths, and with perhaps an equally large number permanently maimed by its destructive effects upon the eye, ear, or other organs of the body. In almost every community there are living today evidences of the terrible effects of this disease. Its more extensive prevalence in former times was due largely to the belief, so common among the people, that children must have the disease at some time, and almost total ignorance of its prevention and restriction. So widespread and so firmly fixed was this idea, that parents even caused their children to be exposed to it when it was "running light," taking the chances that it might be equally mild with them. Thus not a few deaths were caused yearly by the willing exposure of children to this disease, so terrible in its malignant form. In the light of modern sanitation, the absolute and unquestionable error of such a course has been thoroughly demonstrated. A malignant case is not infrequently developed from a mild type of the disease. It has been fully and conclusively proven that scarlet fever is pre-eminently a disease to be largely, if not entirely, prevented by means at our command. In the first place, it is almost wholly a disease of childhood, and the person who escapes it until adult life is not likely to become infected with it at all, although there are occasional exceptions.

It therefore follows that if parents will protect their children for a few years against the contagion of scarlet fever, the liability to contract it will have almost entirely disappeared. In evidence of this we may cite the fact that during the past sixteen years (1884-1899, inclusive) there were reported to the state 533 deaths from this disease, of which 485 occurred among children under fifteen years of age. With our present

knowledge of the character of this disease, the parent who knowingly allows a child to be exposed to the contagion of scarlet fever should be held guilty of an attempt to take human life, and be punished accordingly.

Every case of scarlet fever is dependent upon a prior case, although it is sometimes impossible to trace the channel through which it came to a person or family. It does not rise spontaneously; it always results from an antecedent case.

The Infection of Scarlet Fever.

Scarlet fever is believed to be caused by a special contagium or poison, which may be conveyed to persons previously unaffected, by personal contact, by infected clothing, food, rags, hair, or paper, and probably by any of the discharges from the body of a person affected with the disease. It is believed that the disease may be communicated by a person recovering therefrom so long as the usual subsequent scaling or peeling of the skin continues, which sometimes is not completed before the lapse of seventy or eighty days. The poison may also remain in clothing, etc., for a long time, possibly for years, especially if woolen, and packed away in drawers or trunks:

There is no reason to believe in a primary origin of scarlatina. The efficacy of the virus is so persistent, and it clings so long to clothing, bedding, and furniture, that it can be carried and transmitted long distances by persons, towels, toys, letters, and even domestic animals and articles of food. It is transferable through the whole duration of the disease, from the incubation to the disappearance of the very last symptoms. The incubation of scarlatina may last but a few hours, like that of diphtheria or erysipelas, or as long as nine days; in this it differs greatly from measles, variola, and varicella. The last symptoms may not disappear until long after the fortieth day, which, it is true, is the average termination. The fine desquamation of the second week may have terminated entirely, but the gross peeling, particularly of the hands and feet, extends frequently to the end of the seventh or eighth week. It carries contagion as well as the desquamation of the former weeks, or as the breath of the patient, or his expectoration in the earlier periods. So slow is sometimes the process of elimination that Spottiswoode Cameron claims that the end of the disease is seldom reached before the

eighth week, and not always in the thirteenth. Whether the urine or the alvine dejections of the patient can spread the disease is not quite certain; but so long as there is an uncertainty they ought to be treated as dangerous elements, and disinfected and removed.*

The disease is sometimes spread through infected milk. An outbreak of this disease occurred in a town in New Hampshire under the following circumstances: Scarlet fever appeared in the family of a farmer who sold milk in the village, four members of the family having it. The farmer himself had it in a mild form and without knowing the character of the disease. While in the desquamating, or peeling, stage of the disease he milked his cows and sold the milk to five families who contracted the disease from the milk thus furnished. In another instance two children who had the disease in a very mild form had access to the milk room, and thereby caused the infection to be distributed to eleven families on the milk route.

PERIOD OF INCUBATION.

The interval of time which may elapse after exposure to the contagion of scarlet fever, and during which a susceptible person so exposed may expect to be taken sick with the disease, varies from one to fourteen days.

MANAGEMENT OF THE DISEASE.

Whenever a case of scarlet fever appears, or a condition develops which leads to the suspicion that it may possibly be a case of scarlet fever, the patient should be immediately isolated. In other words, the patient should be placed in a room by himself, from which should be excluded every one but the physician and the nurse, and every known precaution should be exercised to prevent the spread of the disease.

The room to which the case is to be removed should be divested of all unnecessary furniture, such as carpets, rugs, draperies, etc., in order that there may be as few articles as possible to receive the contagium of the disease. The room

*Prof. Jacobi, Archives of Pediatrics, vi, 9.

selected for the patient should be as far removed as possible from the rooms occupied by other members of the family. By this method, and with due precaution upon the part of those attending the patient, a case of scarlet fever may be successfully isolated, even in families having other children.

Suspected cases should be promptly and continuously isolated until it is determined by the physician whether the disease is scarlet fever or not.

Scarlet fever and diphtheria are justly dreaded as the most terrible diseases of childhood. It is, therefore, highly desirable that every one should understand the nature of this disease, and the means to prevent its spread. It is always attended with a bright scarlet eruption on the skin, and is usually accompanied by a sore throat. Whenever children have sore throats, or an eruption of the skin, even mildly, they should be separated from the rest of the family until a physician has seen them, or these symptoms have disappeared. It must never be forgotten that the mildest type of scarlet fever may communicate the most fatal form of the disease.*

Notification.

The attending physician, upon his first visit, should advise the family as to the proper isolation of the case, the measures to be taken to prevent its spread, etc. This having been done, he should promptly notify the local board of health, in accordance with section 3, chapter 110 of the Public Statutes, as follows:

It shall be the duty of every physician who attends any person infected with the smallpox, the malignant cholera, diphtheria, scarlet fever, or other malignant, pestilential disease, immediately to report the same to the health officers or to the selectmen of the town. If any physician shall neglect so to do, he shall forfeit the sum of one hundred dollars, to be recovered by the health officers or selectmen in the name of the town.

Duties of Local Boards of Health.

The local board of health, upon receipt of the physician's notification, or of like information from any source, should proceed to immediate action, in accordance with the duties

*State Board of Health of Pennsylvania.

devolving upon local boards of health in such cases, viz.: Investigate the matter without delay. See that prompt and thorough isolation of the infected person or persons is enforced. The facts should be ascertained by personal investigation, unless such information is furnished by the attending physician.

See that no person, or family, suffers for lack of attendants or want of supplies. This is especially incumbent upon the local board of health when the disease appears among the poor classes. The board of health has the right to assist a person or family in quarantine under the provisions of chapter 100, Laws of 1899.

A card with the words "Scarlet Fever" upon it must be placed in a conspicuous position upon the house, in accordance with the following regulation issued by the State Board of Health:

The board of health will placard each and every house in which there is a case of diphtheria or scarlet fever with one or more cards bearing the word "Diphtheria" or "Scarlet Fever," as the case may be, placed upon the front of the infected house in a conspicuous position, preferably near the entrances, so as to be observed and read by any one approaching the premises. The said card will remain so posted until removed by order of the board of health, and any person removing the same without such an order will be prosecuted according to law.

Notify teachers and superintendents of schools concerning families in which there are cases of scarlet fever.

In every case public funerals of persons who have died from scarlet fever must be prohibited. For the protection of the public, no person other than members of the immediate household who have already been exposed to the contagion of the disease should be allowed to attend such funeral.

The following regulations issued by this board to local boards have the force of law:

By virtue of the authority vested in the State Board of Health by the Public Statutes, it is hereby ordered that, in the rules and regulations adopted by any town or city board within the limits of the state of New Hampshire, the following shall be

inserted and included, and that no rule or regulation which will in any way impair the meaning or force of the same shall be adopted by any town or city:

1. No public funeral shall be held in any instance where the deceased died of smallpox, scarlet fever, or diphtheria.

2. No pupil shall attend any school, public or private, from a house or family where there exists a case of scarlet fever or diphtheria, unless such case or cases are thoroughly isolated from the said pupil, and then only upon the certificate of a physician, certifying to the fact that such isolation is secured, and that in his judgment no liability to spread the disease will follow.

3. No person who has had scarlet fever or diphtheria shall attend any school or other public gathering until three weeks after convalescence has been established, except upon the certificate of a reputable physician.

At the proper time, after the case is convalescent, the local board of health should see that the rooms, clothing, and all articles likely to be infected, are thoroughly disinfected, in accordance with directions elsewhere given.

The local board of health should close the public schools whenever the disease becomes epidemic in the vicinity, or whenever such action is deemed necessary for the public good. Ordinarily it is not necessary to close a school upon the appearance of this disease. There is no danger to the school, if the children of every family in which the disease exists are excluded. It is seldom that the disease becomes so widespread as to make it necessary to close a school.

Transportation by rail, or to any considerable distance by other conveyance, of the bodies of persons who have died of scarlet fever is strictly prohibited, except in compliance with the special regulations of the State Board of Health.

Local circumstances and considerations may suggest to the local board of health measures other than those herein mentioned. A local board of health has full power to make such regulations for the restriction and prevention of a contagious or infectious disease, in addition to those already existing, as it may deem necessary.

Regulations of local boards of health shall not impair or modify the directions herewith provided.

Every case of scarlet fever should be isolated.

Concerning the Sick-Room.

Great care should be exercised to prevent the escape of the contagium of the disease from the sick-room. To this end there must be a constant oversight on the part of the attendants. Soiled clothing, towels, bed linen, etc., should be immersed in a tub or pail of boiling water before being removed from the room, and then placed in a disinfecting solution, as directed on page 47.

The discharges from the throat, nose, mouth, and from the kidneys and bowels of the patient should be received into vessels containing disinfectant Solution No. 2 (see page 48), and in cities where sewers are used thrown into the water-closet; elsewhere the same should be buried at once, at least one hundred feet distant from any well, and should never be thrown into a running stream, nor into a cesspool or privy, except after having been thoroughly disinfected. Discharges from the bladder and bowels may be received on old cloths, which should immediately be burned—or disinfected and buried. All vessels should be kept scrupulously clean and disinfected. Discharges from the nose, ears, etc., may be received on soft rags or pieces of cloth, which should immediately be burned.

If the attending physician should think best for the patient, an effort to prevent the spreading of the contagious particles thrown off from the skin may be made by anointing the body with oil, vaseline, etc., as the physician may direct.

All cups, glasses, spoons, etc., used in the sick-room, should at once, on removal from the room, be washed in Solution No. 1, and afterwards in hot water, before being used by any other person.

Food and drink that have been in the sick-room, or otherwise infected with scarlet fever, should be destroyed or buried. It is best that it should not be put in the swill barrel.

Perfect cleanliness of nurses and attendants should be enjoined and secured. As the hands of nurses of necessity become frequently contaminated by the poison of the disease, a good supply of towels and basins—one containing Solution No. 1, and another for plain soap and water—should always be at hand and freely used.

Attendants on the sick should be as few as possible, and should not communicate with other persons any more than cannot be helped. They should wear only such clothing as may be readily washed. Clothes used in the sick-room should be boiled before being worn elsewhere.

Filth, uncleanliness, and imperfect ventilation may increase the danger of spreading the disease.

During Recovery.

Persons recovering from scarlet fever should be considered dangerous and therefore should not attend school, church, or any public assembly, or use any public conveyance, or even leave their homes, so long as any scaling or peeling of the skin, soreness of the eyes or air passages, or symptoms of dropsy remain. A person recovering from scarlet fever should not thus endanger the public health nor appear in public until after having taken four times, at intervals of two days, a thorough bath. The hair should be thoroughly washed. This cleansing, however, should be deferred until the physician in charge considers it prudent. After recovery from scarlet fever, no person should appear in public wearing the same clothing worn while sick with, or recovering from, this disease, except such clothing as has been thoroughly disinfected, and this without regard to the time which has elapsed since recovery. Nor should a person from premises in which there is or has been a case of scarlet fever attend any school, Sunday school, church, or public assembly, or be permitted by the health authorities or by the school board to do so, until after disinfection of such premises and of the clothing worn by such person if it shall have been exposed to the contagion of the disease.

How to Avoid and Prevent Scarlet Fever.

Avoid the special contagium of the disease. This is especially important to be observed by children and all whose throats are sore from any cause. Children under ten years of age are in much greater danger of death from scarlet fever than are adults; but adult persons often take and spread the disease, and sometimes die from it. Mild cases in adults may thus cause fatal cases among children. Because of these facts it is frequently dangerous for children to go where adult persons go with almost perfect safety to themselves.

Do not let a child go near a case of scarlet fever. Do not permit any person or animal to come, or anything to be brought, directly from a case of scarlet fever to a child. Unless your services are needed, keep away from the disease yourself. If you do visit a case, bathe yourself and change and disinfect your clothing before you go where there is a child.

It is probable that the contagium of scarlet fever may retain its virulence for some time, and be carried a long distance in various substances and articles in which it may have found lodgment. While it is not definitely proved that the germs of scarlet fever are propagated in any substance outside the living human or animal body, it is possible that they may be found to be thus propagated. Therefore, and because the breathing of air laden with emanations from decaying meat, sewers, cesspools, sinks, and other receptacles of filth, is believed to endanger health, great care should be taken to have the house, premises, and everything connected with dwellings kept clean and dry, to have sewer connections well trapped, house-drains constantly well ventilated, and to have all carriers of filth well disinfected. Do not permit a child to enter a privy or water-closet, or breathe the air from a privy, water-closet, cesspool, or sewer, into which non-disinfected discharges from persons sick with scarlet fever have entered, nor to drink water or milk which has been exposed to such air.

Do not permit a child to ride in a hack or other closed carriage in which has been a person sick with scarlet fever, ex-

cept the carriage has since been thoroughly disinfected with fumes of burning sulphur, as specified.

Do not permit a pupil of a public school to re-enter school without a certificate of a physician that the proper precautions have been observed.

Do not permit a child to attend school from any family or building in which there is a case of scarlet fever, or has been such within a period of forty days previous. Public schools are a most prolific source for the spread of this disease.

Do not wear or handle clothing worn by persons during their sickness or convalescence from scarlet fever.

Beware of any person who has a sore throat. Do not kiss nor take the breath of such a person. Do not drink from the same cup, nor use any article that has been used by a person sick with this disease.

Disinfectants to be Employed.

[The following are also applicable in other diseases and conditions.]

SOLUTION NO. 1.

Chloride of lime (bleaching powder), one pound; water, three gallons. Mix.

Care should be taken to obtain fresh chloride of lime.

This solution is so cheap that it can be used with great freedom, and it is one of the best disinfectants known. A quart or more per day may be used in an offensive vault, and such quantities as may be necessary in other places. It may be used in a sprinkler in stables and elsewhere. In the sick-room it may be used in vessels, cuspidors, etc. Sheets and other clothing used by the patient may be immersed in a pail or tub of this solution, diluted (one gallon of solution to ten of water), for two hours, or till ready for the wash-room or laundry. This solution is non-poisonous and does not injure white clothing.

It may also be used for washing the hands or other parts of the body which may have been exposed to infection from excreta, etc.

For a free and general use in privy-vaults, sewers, sink-drains, refuse heaps, stables, and wherever else the odor of the disinfectant is not objectionable, this is one of the cheapest and most effective disinfectants and germicides available for general use. It should be used so freely as to wet everything required to be disinfected. Its odor does not disinfect—only covers up other odors.

SOLUTION NO. 2.

Corrosive sublimate, one ounce; permanganate of potash, one ounce; water, eight gallons. Mix and dissolve.

Use the same way and for the same purpose as No. 1. The only advantage this has over No. 1 is the fact that it possesses no odor. It is poisonous, but its bright purple color will prevent its being mistaken for any other solution. It should be used in vessels, cuspidors, etc., in case of infectious or contagious disease when Solution No. 1 is objectionable on account of its odor. It is not so good a disinfectant for vaults, sink-drains, sewers, etc., as the chloride of lime solution. It should not be kept in metallic vessels.

SOLUTION NO. 3.

*Milk of lime.** Milk of lime may be prepared by sprinkling one quart of water gradually upon a quart of quick-lime in broken pieces in a metallic or wooden vessel. When the lime is reduced to powder, three quarts of water should be added, and the whole kept in a covered vessel.

SOLUTION NO. 4.

After a case of infectious or contagious disease, a solution made as follows may be used to wash the floor, bedstead, chairs, and other furniture:

Corrosive sublimate, one dram; water, one gallon. Mix and dissolve.†

The walls and ceiling, if plastered, should be whitewashed with a lime wash containing the same proportion of corrosive

* This has recently received much favor as a disinfectant on account of its efficiency, cheapness, and lack of unpleasant odor.

† This solution should be used only under the direction of a physician, as it is a poisonous mixture.

sublimate, or they may be brushed over with the aqueous solution. Especial care must be taken to wash away all dust from window ledges, and other places where it may have settled, and to thoroughly cleanse crevices and out-of-the-way places. After this application of the disinfecting solution, and an interval of twenty-four hours or longer for free ventilation, the floors and woodwork should be well scrubbed with soap and hot water, and this should be followed by a second more prolonged exposure to fresh air admitted through open doors and windows.

A solution of carbolic acid may be employed in the place of Solution No. 4, one part of the pure acid to twenty parts of water. This is also a good general disinfectant for use in the sick-room when its odor is not objectionable.

Disinfection of Premises.

Cellars, yards, stables, gutters, privies, cesspools, water-closets, drains, sewers, etc., should be frequently and liberally treated with Solution No. 1. If the odor of chloride of lime is objectionable, Solution No. 3 may be used. Ordinarily dry earth or air-slacked lime, if used daily in a privy-vault, will keep it well disinfected and free from odor. This is especially recommended for use at summer cottages, camp-grounds, etc., but to be effective it must be used daily, or, better, several times a day.

To keep a privy-vault disinfected during the progress of an epidemic, sprinkle chloride of lime freely over the surface of its contents daily. Or, if the odor of chloride is objectionable, apply daily four or five gallons of Solution No. 3, which should be made up by the barrel and kept in a convenient location for this purpose.

Copperas may also be used to arrest decomposition, but its value is small for any other purpose. It is not efficient in the destruction of the germs of the disease.

Disinfection of the Person.

The surface of the body of a sick person, or of his attend-

ants, when soiled with infectious discharges, should be at once cleansed with a suitable disinfecting agent. For this purpose Solution No. 1 may be used. In diseases like smallpox, diphtheria, and scarlet fever, in which the infectious agent is given off from the entire surface of the body, occasional ablutions with this solution, diluted with ten parts of water, will be more suitable than the stronger solution above recommended.

In all infectious diseases the surface of the body of the dead should be thoroughly washed with one of the solutions above recommended, and then enveloped in a sheet saturated with the same.

Disinfection of Clothing.

Boiling for half an hour will destroy the vitality of all known disease germs, and there is no better way of disinfecting clothing or bedding which can be washed than to put it through the ordinary operations of the laundry. No delay should occur, however, between the time of removing soiled clothing from the person or bed of the sick and its immersion in boiling water, or in the diluted solution mentioned under Solution No. 1; and no article should be permitted to leave the infected room until so treated.

Fumigation.

Fumigation with sulphur has ever been regarded as a reliable method of disinfecting a house, and either that or formaldehyde should be resorted to after a case of smallpox, diphtheria, or scarlet fever, and in such other cases as the attending physician or the board of health may think best. To do this, the house must be vacated. Heavy clothing, blankets, bedding, and other articles, which cannot be treated with solution, should be opened and exposed during fumigation, as directed below. Close the room as tightly as possible, place the sulphur in iron pans supported by bricks placed in wash-tubs containing a little water; set it on fire by hot coals, or with the aid of a spoonful of alcohol, and allow the room to remain closed for twenty-four hours. For a room about ten

feet square, at least three pounds of sulphur should be used; for larger rooms, proportionally larger quantities. Heavy woolen clothing, silks, furs, stuffed bed covers, beds, and woolen articles, which cannot be treated with disinfectants, should be hung in the room during fumigation, their surfaces thoroughly exposed, and their pockets turned inside out. Afterward they should be hung in the open air, beaten, and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, etc., should be cut open, and the contents spread out and thoroughly fumigated. Carpets are best fumigated on the floor, but they should afterward be removed to the open air and thoroughly beaten.

Disinfection by Formaldehyde.

Formaldehyde is now considered to be superior in every respect to sulphur for the disinfection of rooms and their contents, if carried out with care and exactness. The room to be disinfected is sealed and prepared as usual for sulphur disinfection. All its surfaces are exposed as much as possible; closet doors are opened and their contents, together with the contents of drawers, are removed, scattered about, and the drawers left open; mattresses are set on end, pillows, bedding, clothing, etc., are suspended from lines stretched across the room or spread out on chairs or other objects so as to expose all sides; books are opened and the leaves spread,—in short, the room and its contents are so disposed as to secure free access of the gas to all parts as fully as possible. Upon this preparation largely depends the thoroughness of the disinfection.

For every 1,000 cubic feet of space in the room is suspended, by one edge, an ordinary bed sheet (2 x 2½ yards) from a line stretched across the middle of the room. Properly sprinkled this will carry without dripping five (5) ounces of formalin,—the 40 per cent solution of formaldehyde,—which is sufficient to disinfect 1,000 cubic feet of space.* As many sheets as

* I am of the opinion that it would be much better to use double this amount in order to be sure of complete results.—I. A. W.

necessary are used, hung at equal distances apart. The ordinary, rather coarse, cotton sheet should be used in order to secure rapid evaporation.

The sprinkling is done by means of a spray producer, as it is found by long experience that the freest evolution of the gas, with the minimum production of paraform, is secured from very minute drops of the solution, individually scattered on the evaporating surface—not touching or running together.

When all is in readiness in the room, the disinfector ties a damp towel over his mouth and nose, and, beginning with the sheet farthest from the door of exit, rapidly sprinkles each sheet on his way out, being careful to spray evenly and no space more than once.

The evolution of the gas is so rapid that the air becomes irrespirable in about three minutes, so that quick action is necessary. It has also been found necessary to provide the operators with surgeon's rubber gloves to protect the hands and wrists from the spray.

The room is left closed not less than five hours, after which it is opened up as freely as possible to light and air; the family is instructed to have all woodwork well scrubbed with soap and hot water or with the mercuric-chloride solution, and the furniture and other objects thoroughly wiped off with cloths dampened with dilute formalin, one part formalin, twenty parts water.

SCARLET FEVER.

Its Prevalence, Correspondence Relating Thereto, Etc.

During the past two years there have been reported quite a large number of cases of scarlet fever from certain localities: Manchester, Concord, Milford, North Walpole, and elsewhere. The type of the disease has been mild, and there has been, therefore, great difficulty in suppressing it. However, the total mortality from scarlet fever has been so much reduced under sanitary regulations that it takes a very subordinate

place among the causes of death, there being only twenty-five fatal cases reported for the entire state during the year 1898, and twenty cases for the year 1899.

When the disease appears in a mild form it is very difficult to control, for the reason that, with "walking" cases that do not come to the attention of the physician or the health officer, proper isolation is not secured, hence the disease becomes widespread, with now and then a fatal case. On the other hand, when it appears in a severe type the regulations for its restriction are carried out to the letter, and it is correspondingly easy of control.

The mildness of the disease, as it has prevailed during the past two years, may be noted by the fact that for the year 1899 one hundred and thirty cases were reported to the board of health of the city of Manchester, with only three deaths. In Concord, for the same period, ninety-nine cases were reported, with only one death. The percentage of mortality to the total number of cases was but little greater in other localities.

The health officer of Concord, in his report, says:

"In many instances medical aid would not be called until desquamation had commenced, or until the occurrence of secondary cases in the same family, therefore the cases were not reported until a large number of children had been exposed."

The board of health of the city in its annual report, under the head of Scarlet Fever, says:

"It is well-nigh impossible to estimate in dollars and cents the cost of the epidemic of scarlet fever from which we suffered during the year, but we can have some adequate idea of it when we recall that from August 3 to December 31 there were reported to this office ninety-nine cases; seventy-five of these represented as many different families. The loss in wages and the increased cost of maintenance would foot up to a very high figure, while the anguish of mind, pain of body, the isolation depriving them of converse with others, and, in the case of children, the prolonged absence from

school, cannot have their sad features figured out on any financial basis. Neither can the loss of a life be computed by any such system, though attempts are made to do so, and we may well feel thankful that out of so many cases only one death occurred. One thing we deeply regret,—the absence of a hospital for these cases. Had we in our city an institution for the proper care of contagious diseases, we fully believe many of these cases would never have happened. Notwithstanding the strenuous efforts put forth by frequent visitations of the health officer, re-enforced for some time by a police officer patrolling the infected district, it was not possible at home to keep them isolated or effectually quarantined. In many instances the disease was so light in its course and the symptoms so poorly defined that undoubtedly there were not a few unrecognized until other cases in the family or playmates made a diagnosis certain. This fact aided greatly in its spread and for a while all of our best efforts seemed in vain. Everything deemed necessary to stay its progress was resorted to, and recognizing the dangers to the children attending the Walker and Franklin schools, we adopted at our regular meeting, September 2, and immediately forwarded to the board of education the following resolution:

" 'It is the sense of the board of health, that on account of the prevalence of scarlet fever in the vicinity of the Walker and Franklin schools, those buildings should not be opened until the spread of the disease is past.'

"So the opening of the school year for those two schools was postponed for four weeks. The epidemic was confined to the territory north of Washington street until October 14, when a case was reported from the previously uninfected part of the city, and then followed cases from all directions. Much unnecessary alarm was caused by exaggerated reports and demands made on us to close all of the schools, but the exigency did not seem to us to exist. The situation was closely canvassed, and, at a special meeting, Sunday, November 5, it was voted to close one room at the Chandler school, and ask a conference with the board of education at their regular

meeting the next evening. As a result of the conference the board of education adopted the following resolution:

" 'That the board of education express to the board of health its hearty approval of the suggestion for daily inspection of the schools in the central part of the districts, and grant permission to the board of health and its agents to institute such inspection as it deems wise.'

"Immediately following the conference, we assigned the following physicians to make the inspections:

Tahanto school . . .	Dr. Ralph E Gallinger.
Walker school . . .	Dr. A. P. Chesley.
Franklin school . . .	Dr. Russell Wilkins.
Merrimack school . .	Dr. F. W. Grafton.
Kimball school . . .	Dr. N. W. McMurphy.
Bow Brook school . .	Dr. George H. Parker.
Chandler and Parochial schools	Dr. D. E. Sullivan.
Rumford school . . .	Dr. A. K. Day.
Penacook school . . .	Dr. E. A. Clark.
Cogswell school . . .	Dr. S. G. Morrill.

"Subsequently, Dr. Chauncey Adams assisted in the work; and to these physicians who so faithfully aided us in limiting the progress of this and other contagious diseases, are we deeply indebted.

"On Tuesday, November 7, the inspections were commenced; the visits were made early in the morning session; the teachers rendered hearty co-operation; the pupils were examined separately; the routine of the school work was not appreciably disturbed, and we know much good was accomplished. We believe it was the first time in the history of the schools of the state that a daily systematic inspection of the scholars was made, and from the results we are assured the innovation was most beneficial, and, regardless of outbreaks of disease, might, with much profit, be regularly repeated.

"On December 11, the thorough fumigation of all the schools was commenced, the health officer being assisted by the janitors of the different schools; and from basement to at-

tic was the cleansing process carried out. All floors, windows, furniture, and surfaces that could be scrubbed were submitted to plentiful applications of soap and water with sufficient formalin added to destroy all germs. Formalin, sprinkled on suspended sheets, was the agent used in fumigation.

"The success which attended all these efforts was due in a large measure to the hearty co-operation extended and valuable assistance rendered by the board of education, and by Mr. L. J. Rundlett, superintendent of the schools of Union school district."

In addition to the above report, it may be stated that the system of daily inspections, above mentioned, was followed by marked results, not only in the suppression of scarlet fever, but in the discovery of other disease conditions which should not be permitted in the schoolroom.

Correspondence.

Following are several letters, chiefly pertaining to the management of scarlet fever. It may be stated that none of them were written with the intention of their being published, and they are given here solely because they cover many points that are continually coming up:

Canobie Lake, N. H., January 7, 1900.

Dr. I. A. Watson, Secretary State Board of Health, Concord, N. H.:

Dear Sir,—I write you at this time for instruction as to the duties of the local board of health. We have had two cases of scarlet fever in town, in the east part, so they have come under my personal supervision. They were school children: One the only child in the family; the other was one of seven. They proved to be light cases, and in my judgment it did not seem necessary to quarantine strictly. Placarded the house, and cautioned them to be careful in leaving the premises, using disinfectants, etc., and when the doctor said it was time, to fumigate the house thoroughly.

In the first case the child has recovered, and all seems safe. In the other family two more of the children were taken after the premises were fumigated, and the child which had

been sick had been allowed to mingle with the other children. They have requested me to fumigate the premises for them. Is it the duty of the board to do so when requested, if the family are able to attend to it and have the means?

I thoroughly fumigated the schoolroom with its contents, and no new cases have occurred. The school has been in session four weeks.

I have been a member of the board for three years, and have asked for no compensation for services. I know that the town is held to pay for supplies furnished, and believe it is to be held for the services of the members of the board. Am I correct? Please inform me on that point, and also whether we should strictly quarantine in malignant cases of scarlet fever, diphtheria, etc.

Yours truly,

(Signed) J. H. DINSMORE.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., January 9, 1900.

Mr. J. H. Dinsmore, Canobie Lake, N. H.:

DEAR SIR,—Your letter of January 7 has come to hand. I note what you say concerning the cases of scarlet fever. Every case of this disease, whether mild or severe, should be thoroughly quarantined. It is by the mild cases that this disease is mostly spread. The cases which are walking about, and upon which there is a lax quarantine, or none at all, are the very ones that spread the disease through the community. We have just had an experience with mild cases in this city, and it is a condition that has been often met with. Moreover, a most malignant and fatal case may at any time be contracted from a mild case; so there is but one rule to follow, and that is to quarantine every case effectually, whether it is severe or not, and to disinfect the premises, clothing, etc., thoroughly at the proper time.

It is the duty of the board of health, not only to placard the house and to order the patient or family to be so isolated as not to spread the disease, but also to see that these rules are carried out and to see that the premises are thoroughly disinfected at the proper time. This is the duty of the board of health, whether the family is able to attend to it or not. It is the practice everywhere.

It is an imposition upon a health officer to serve without pay. A board of health is of just as much importance to a town as a board of selectmen. It is as legally constituted, and equally entitled to reasonable compensation for services. You should make a *per diem* charge for your services as health officer, and the town is obliged to pay it. There is no reason why the average health officer should not charge a *per diem* equal to that charged by the members of the board of selectmen. It would be just as reasonable to ask the selectmen to serve without pay as to ask the board of health to do so. I hope that no health officer in this state will serve without compensation. It is an injustice to the individual, and at the same time belittles the office.

We are just sending out the Sanitary Bulletin, three copies of which are addressed to the board of health of every town. You will find in it reference to the compensation of health officers, and also the law relating to assisting families in quarantine.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

ANTRIM, N. H., March 1, 1900.

Dr. Watson:

DEAR SIR,—As you have been previously informed, we are having a little trouble here in Antrim with scarlet fever, with a result that is very detrimental to the interests of our schools. In what I say in this note I do not wish to find any fault with the persons in authority here, for they are very good friends of mine, and I do not wish to criticise; but in my humble opinion it seems that possibly undue precautions are being taken on the school question. We have been closed now for about eight weeks, and during that time there have been about fifteen cases of the fever.

Unless I am misinformed, other towns and cities where the disease has bordered much more nearly on an epidemic have allowed their schools to continue in session.

Again I ask you not to mark me as wishing to criticise. I simply do not understand why, if other towns continue their schools under worse conditions than ours, we cannot go on. It seems to me to be possibly a case of over-caution.

Should you see fit to reply to this note I should be pleased to know your opinion of the situation, as my position is such as to make me a somewhat deeply interested party.

Truly yours,

(Signed) O. H. TOOTHAKER,
Principal of High School.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., March 3, 1900.

O. H. Toothaker, Principal High School, Antrim, N. H.:

DEAR SIR,—I am in receipt of your favor of March 1, and in reply would say that, inasmuch as it is probable that I do not know all the details of the outbreak of scarlet fever in your town, I think it would not be best for me to express an opinion as to whether or not it was wise to close the schools and to keep them closed to the present time.

From the facts which have been presented and of which I have knowledge, I am inclined to the belief that it was best to close the schools, for the reason that quarantine in some cases has not been efficiently maintained, and there seems to have been good ground for the belief that the contagion was scattered.

The matter of closing schools rests with the local authorities, and the practice differs in different localities. Some boards take the ground that with efficient isolation of cases there is no necessity for closing schools; others, that the schoolroom is often the greatest source of infection, and, therefore, after the appearance of a few cases that the schools should be closed. I believe that ordinarily the former position is the correct one.

If your schoolroom should be thoroughly disinfected, and the cases of scarlet fever effectually quarantined, there would be no reason why the school might not be reopened. The State Board of Health has no direct authority in questions of this kind. We are advisory to local boards of health, except in cases where a disease becomes epidemic and the state assumes the management of it.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., March 5, 1900.

Board of Health, Antrim, N. H.:

GENTLEMEN,—The prevalence of scarlet fever in Antrim and adjacent localities has been reported to this board, ver-

bally, by some of the health officers, officially by the boards, and also by private written communications from individuals, so that we believe we have a thorough and intimate knowledge of the situation, and therefore take the liberty to advise you in regard to the matter.

It would seem that there are some thirteen or fourteen cases within the town limits at the present time, and that the disease thus far has been of a comparatively mild type. Not infrequently the mild cases, "walking" cases, so to speak, are responsible for the spread of the disease, in spite of the most vigorous efforts of a board of health. This occurs because the cases are unreported or unrecognized; especially when the disease is prevailing in a mild form the danger of its spread from such sources is very great.

Another cause for the spread of the disease is an inefficient quarantine,—cases in which the orders of the board of health are violated. It would seem that this last condition has prevailed to a certain extent in your town. At least one family is authoritatively charged with having violated the rules and regulations relative to the isolation and quarantine of patients, and it is not unreasonable to assume that the disease may have been spread by reason of this.

Scarlet fever is altogether too grave a disease, both as to fatality and serious and not infrequently lasting effects, to be trifled with. It matters not whether the disease is prevailing in a mild form or not, every case should be effectively isolated and the quarantine rules and regulations carried out to the letter.

In case of defiance of the regulations, or a willful violation of them, the board of health should cause the prompt arrest of the offending party and see that they are punished to the full extent of the law. It is not often that such a procedure is necessary, but in some cases heroic action is called for, and the board of health should certainly be quick to act when necessary, to prevent the spread of such diseases as diphtheria, scarlet fever, etc.

With prompt notification by the attending physician in all cases, effectual isolation for a proper period and thorough disinfection following, it is practically impossible for scarlet fever to become epidemic. With such efficient measures in force, the community and the people of adjoining towns have little or nothing to fear from the existence of a few cases in a given locality.

The question of closing the schools is dependent wholly upon local conditions and the effectiveness with which con-

trolling regulations are enforced. If every case is isolated and the regulations strictly enforced, and with no unreported cases, there would seem to be no reason why schools should be closed, unless the disease has already assumed such proportions as to constitute a general epidemic. On the other hand, if there are doubts as to unreported and unrecognized cases, the school board, after consultation with and upon the recommendation of the board of health, would be justified in closing the schools until such time as it might be deemed wise to reopen them.

Notification, isolation for a sufficient period, and thorough disinfection are the means of controlling this disease, and we trust that your board will thoroughly enforce all these requirements in every case, to the fullest extent of the regulations and the law.

In regard to disinfection, that should always be carried out under the immediate supervision of the board of health, and never entrusted to the family or any other person not an agent of the board. A great deal of the so-called disinfection is absolutely worthless, hence this work should always be performed by direction of the board of health.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

BENNINGTON, N. H., February 17, 1900.

G. P. Conn, M. D.:

DEAR DOCTOR,—I have a condition of things that I desire to write you about, and would like your advice. I had a case of scarlet fever in the town of Antrim, a girl twelve years old, progressing favorably, and at the end of twenty days, desquamation having to all appearances finished, I ordered general bath of carbolic, 1-60, and fumigated with sulphur the room where she was isolated. After two days the shins and hands began to look cracked and rough, and the skin came off in small scales. Whether it was a dermatitis set up by the carbolic, or scarlet fever desquamation hastened by carbolic, I do not know; but the board of health said it was scarlet fever and kept the card up. In the mean time the mother of the child has given birth to a baby. The board of health proposed to fumigate all the house but the room occupied by the nurse and the mother, and let that go; but I objected, and the husband did also, as it is useless to fumigate in any such manner.

Now, can the board of health fumigate without my consent? Can they fumigate in the manner suggested above if I object to it? Does the law require that cases of probable scarlet fever, no eruption except in mouth, shall be placarded? Do people have scarlet fever twice, *i. e.*, are there many cases? For example, a woman in confinement broke out all over body with vivid scarlet rash, fever, etc.; peeled. She had scarlet fever when quite small. Would you consider it was scarlatina?

We had reported to us today a family where two children broke out and peeled (slightly sick, no doctor) two or three months ago. One child now is quite sick. Dr. —— says they had scarlet fever, and this is the result. Would you say the board of health ought to fumigate those premises?

Awaiting your reply, yours, fraternally,

(Signed) E. H. TAFT, M. D.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., February 19, 1900.

E. H. Taft, M. D., Bennington, N. H.:

DEAR DOCTOR,—Your favor of February 17, to Dr. Conn, has been referred to me with a request that I reply to some of your inquiries.

The case of scarlet fever in the town of Antrim, which desquamated at the end of twenty days, and afterward peeled, is not absolutely unique, nor are such cases unknown. In discussing this subject, Professor Jacobi says that the desquamation about the second week may have terminated entirely, but the gross peeling, particularly of the hands and feet, frequently extends to the seventh or eighth week. I cannot say what effect the carbolic acid bath may have had in this particular case.

In regard to the fumigation of houses, I should expect that the board of health would be guided by the opinion of the attending physician. The board of health has the undoubted right to insist that the premises shall be fumigated, but if the attending physician should object to the fumigation at a given time the board of health would, of course, maintain the quarantine until the premises were fumigated.

The regulations require that all premises where scarlet fever exists shall be placarded. Ordinarily the board of health should accept the diagnosis of the attending physician, and if a case is pronounced to be scarlet fever, no matter how mild the case may be, the premises should be placarded.

In exceptional cases children have been known to have scarlet fever twice. In the case of the woman who broke out with a vivid scarlet rash, had fever, etc., and desquamated, I should certainly say that she had scarlet fever, even though she may have had the disease earlier in life.

The board of health should fumigate all premises where there has been a case of scarlet fever, no matter how mild the disease may have been. It is usually the mild cases that spread the disease. We have had a serious time in this city during the present season, on account of the mild cases,—really "walking" cases,—unattended by any physician, and perhaps unrecognized. Other places have had a like experience during the present winter, notably North Walpole, where there were many mild cases, with one malignant case that terminated fatally in a few hours. Mild cases should certainly be looked after, and all premises disinfected.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

BARRINGTON, N. H., August 21, 1899.

Secretary State Board of Health:

DEAR SIR,—We have the pamphlet in regard to the cases of scarlet fever, but I would like to know your own idea in regard to a very mild case in the country. Should the case, or the case and family, be isolated? The case is a young married lady, and she is nicely, but has not peeled. She has been out of doors, but on her own land. A complaint has been made to the effect that children are liable to take the disease. What would you advise in such a case; to keep the patient in her own room or in the house until she has peeled, or what? I await a reply from you.

Very respectfully yours,

(Signed) HENRY W. LOCKE,
Board of Health.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., August 24, 1899.

Henry W. Locke, Secretary Board of Health, Barrington, N. H.:

DEAR SIR,—In reply to your favor of August 21, I would say that mild cases of scarlet fever should be as effectually isolated as malignant ones. These mild cases, that are not properly looked after, do more to spread the disease than any others,—indeed, it is through these cases that scarlet fever is spread through a community in a majority of cases, probably. A case of scarlet fever contracted from a mild form of the disease may prove to be of the most malignant type.

In a case such as you mention, there would be no objection to the patient's going out of doors in her own yard, provided that by so doing she was not brought in contact with other persons. In other words, she might be permitted to go out upon her own premises, if by so doing she did not endanger the public. This depends entirely upon circumstances and conditions, of which you can, yourself, judge; but it should be borne in mind constantly that mild cases of scarlet fever should be thoroughly isolated, and the quarantine maintained until after desquamation is completed. At the proper time, after the completion of desquamation, the premises should be thoroughly disinfected.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

FRANKLIN FALLS, February 20, 1899.

Irving A. Watson, M. D., Secretary State Board of Health, Concord, N. H.:

MY DEAR SIR,—Will you kindly answer the following questions:

1. How long should a mild case of scarlet fever, or scarlatina, be quarantined?
2. How long should a severe case of the same disease be quarantined?
3. Should a child who has been exposed to scarlet fever

by the sickness of a member of the same household be released from quarantine sooner that the sick patient?

4. How long is it wise to keep all cases of scarlet fever, mild and severe, out of school?

Sincerely,

(Signed) JOHN W. STAPLES.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., February 21, 1899.

John W. Staples, Chairman Board of Health, Franklin Falls, N. H.:

DEAR SIR,—Your favor of February 20 is at hand. In reply I would say that you will find your questions substantially answered in the inclosed pamphlets. Whether the case of scarlet fever is mild or severe, the patient should be isolated until well, and until desquamation is completed. This, as you know, may take place in a relatively short time, or may be continued for several weeks. A careful examination, or inspection, by a physician would be necessary to determine this question.

A child who has been exposed to scarlet fever through the sickness of a member of the same household, if the disease was not contracted, and the child was isolated from the patient, might be released from quarantine at the time or before the patient himself could be.

No arbitrary law as to how long pupils who have had scarlet fever shall be excluded from school can well be established, or, if established, is entirely unscientific. True, it has to be done sometimes; but a much better way would be to rely upon the judgment of the attending physician in each individual case as to when the child can with safety to others be returned to school. A restrictive period of forty days, as has been established by some boards, would doubtless cover a majority of cases, but in some instances desquamation is not completed in that time, and great danger would follow their admittance to school. Were it not for these difficulties, and the very mild cases that are not recognized as scarlet fever, there would be no difficulty in stamping out the disease.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

AMHERST, N. H., March 28, 1899.

I. A. Watson, M. D.:

DEAR SIR,—I would like to have you answer a few questions, that are of interest to me, about scarlet fever. Upon the breaking out of a case, the family move out of the house, leaving the mother and sick child at home, and in about twenty-five days after another child comes down with the disease and is taken home with the first case. Is it a usual thing to shut up the remainder of the family and placard the house, taking away all source of income to a poor family, and keep them shut up for twenty-one days, expecting other cases to break out in the family?

Is there any danger in children's talking or looking through shut windows of an infected house?

Is not the danger of a doctor's carrying it away greater than from the members of the family that were away at work when the second was taken? The adult members were working in a shop where there were no chidlren, and were at home only nights.

Is it usual for a child to give it to another in three hours after it was taken?

If a child should be away visiting and be very suddenly taken sick, and a physician should pronounce it to be scarlet fever and should have the child sent home, should you consider that that family ought to be quarantined?

What should be done when one physician says a case is scarlet fever, and another says it is not, both being friendly and equally sure? Should they wait until they are sure before reporting, thus going over the twenty-four hours given us to report?

In case of scarlet fever in a physician's family, can the board of health prevent him from visiting his patients, or their going to his office, it being in his home?

Very truly,

(Signed) J. B. PETTENGELL.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., March 31, 1899.

J. B. Pettengell, M. D., Amherst, N. H.:

DEAR DOCTOR,—I am in receipt of your favor of March 28, and in reply would say that it is almost impossible to answer

directly all the questions which you propound, because of the many varying conditions which have to be taken into consideration in a given case. Moreover, it is better for a board of health to err on the side of safety, than to be negligent in a single case. In the case which you cite, it is evident that the child who came down with scarlet fever on the twenty-fifth day after having been removed from its home, did not contract the disease before being removed in the first instance, and the presumption is that it got the disease elsewhere, or the infection was carried with the family. The house might, therefore, be regarded as infected, and the supposition that others had received the infection would be reasonable, and a quarantine would be not only proper, but necessary.

Probably there would be very little danger, if any, of contracting the disease through a closed window. I suppose there are instances in which the attending physician has communicated the disease to others; but if he uses the necessary precautions, such an event would not occur. I believe the standard medical authorities admit that scarlet fever may be communicated from its very onset, but that such is not the rule.

In case two physicians cannot agree as to a diagnosis, one maintaining that the disease is scarlet fever and the other that it is not, it is the duty of the one to report immediately to the board of health, and the said board should quarantine the premises, put up the placard, and take such other measures as are usual. If it should be proven later that the disease was not scarlet fever, no harm would have been done.

A board of health may establish such rules and regulations as it deems necessary and best to control a contagious or infectious disease, even to the extent of quarantining every member of a family. The function of a board of health in such cases is, of course, to prevent an extension of the disease. Different boards of health adopt somewhat different methods of procedure, some of which are perhaps sometimes somewhat arbitrary and may in some cases be unnecessary; but it is very difficult to control such a course, inasmuch as the authority is vested in the local board itself. Good judgment and common sense are necessary in the application of sanitary rules and regulations, and with such it is very seldom that any hardship or injustice follows. Boards of health are sometimes too officious, and doctors are not infrequently negligent, and occasionally, but very rarely, there is a lack of co-operation between

the two, which is not creditable to either. I trust, however, that such a condition does not exist in your town.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

AMHERST, N. H., April 10, 1899.

Dr. Irving A. Watson, Secretary State Board of Health, Concord, N. H.:

DEAR DOCTOR,—I wish to know if the law is specific relating to the amount of aid a given town is liable to be obliged to give a family while being held in quarantine? The —— family, which has scarlatina, is quite numerous (seven children, nine in family), and if they all have it, it will necessitate quite a protracted quarantine and considerable expense, since they are poor.

I also want to know what to do with a man in case he does not observe quarantine after his house is placarded? Mr. —— runs around the village, I have been told; he is lawless, which makes it very difficult. Now, whatever the law will back us up in, we will act in accordance with the law prescribed, as we wish to prevent the spread of the disease, if possible.

Very respectfully,

(Signed) FREDERICK CHANDLER.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., April 10, 1899.

Frederick Chandler, M. D., Health Officer, Amherst, N. H.:

DEAR DOCTOR,—In reply to your favor of even date, I would say that the law is not specific in regard to the amount of aid that a board of health may give to a family in quarantine. I inclose herewith a copy of the law which was enacted at the recent session of the legislature, approved March 11. You will see that the matter is wholly in the hands of the local board of health, to do as they deem necessary.

If any person or persons violate your quarantine orders or regulations, they should be brought before a justice of the peace, or into a police court, and fined without delay. Jus-

tices of the peace and justices of the police court have the power to impose a fine not exceeding ten dollars for each offense. It is the quickest way to get a case of this kind disposed of. We have had several examples of the kind in this state, and it has always had a salutary effect in the community, causing respect to be felt for the board of health and its orders.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

GROVETON, N. H., January 30, 1899.

Irving A. Watson, M. D.:

DEAR SIR,—Will you kindly give me your opinion in regard to the manner in which cases of scarlet fever should be treated? Does the law require us to put the placard on the outside of the house, or would it answer the same purpose on the inside?

Also, should all persons be kept from going in or out as long as the disease is in evidence at any house? An early reply will greatly oblige,

Very truly yours,

(Signed) W. C. HAMILTON,
Secretary Local Board of Health.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., January 31, 1899.

W. C. Hamilton, Secretary Board of Health, Groveton, N. H.:

DEAR SIR,—Your favor of January 30 is at hand. I send to you by same mail some little pamphlets on the "Restriction and Prevention of Scarlet Fever," which will give you information on the sanitary care of this disease. It would by no means satisfy the law to put up the placard on the inside of the house; the card must be placed where the public will see it. It is intended as a warning to the public, so that all persons may avoid entering where the disease exists.

In a block, where several families reside, it is permitted that the card may be put up in the corridor, on the door of the premises where the disease exists, if in the judgment of the local board of health sufficient precautions are otherwise taken in

the case. Whether all persons in an infected family should be kept at home is a question depending entirely upon circumstances, and which must be determined by the board of health in each individual case. For instance, if a child sick with scarlet fever were completely isolated in an upper room in a house, and every precaution taken against any person other than the nurse being exposed to the case, it would not be necessary to keep such other members of the family in quarantine; but children from a house in which the disease exists should not be permitted to attend school or to attend other gatherings of children. If, however, the board of health were not positive that the prescribed precautions would be observed, or if there were not proper opportunities for isolating the patient, then all the members of the family should be restricted from mingling with the public until all danger of infection is past.

We would respectfully call the attention of your board to the fact that you are required to report to the State Board of Health the presence of any of the quarantinable diseases that may exist in your town. Blanks for that purpose have been sent to you from time to time, but I send more to you under separate cover.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

NEW IPSWICH, N. H., April 5, 1900.

Secretary State Board of Health:

DEAR SIR,—I have just been appointed one of the board of health, and as there has been at times all winter, and is now, some scarlet fever in town, I would like to know, officially, what the duties of the board of health are in such cases, that is, how long is a case to be quarantined? Is the whole family to be kept in the house? Who should do the fumigating? Is it optional with the board whether the schools, or any one of them, be closed? How long after a child is taken sick before it, or other children of the family, can go to school? If the case is kept in an upstairs room, away from the rest of the family, how about the people going out to the postoffice, stores, and on other errands? How can one determine whether the case is *strictly separate from the rest of the family?*

The fact is I would like all possible information on the subject. Do the same rules apply in other cases of contagious diseases?

Yours truly,

(Signed) G. F. LOWE.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., April 6, 1900.

G. F. Lowe, Member Board of Health, New Ipswich, N. H.:

DEAR SIR,—Your favor of April 5 is received. I have today sent you a few copies of the Sanitary Bulletin, just issued, which contains an article on the "Restriction and Prevention of Scarlet Fever," and which, I think, will answer the main points of your letter. I will say, however, in addition, that all cases of scarlet fever should be quarantined until desquamation has been completed and the premises fumigated. There can be no fixed time for this, as cases vary so much. Usually the opinion of the attending physician is taken on this point.

A person sick with scarlet fever may be so effectually quarantined in an upper room of a house that the disease need not spread to other members of the family; but it would be necessary for a board of health to be *absolutely sure* that a strict quarantine was maintained, else they would not be warranted in allowing other members of the family to visit public places. If there were any doubt upon this point, the board should insist upon a strict quarantine of the family.

In all cases the fumigation should be carried out by the local board of health, as not one family in twenty knows anything about disinfection, or would intelligently follow directions given by the physician or the health officer. It is the universal practice for the local board of health to see that disinfection of the premises is efficiently carried out.

A board of health has the undoubted right to close a public school when an infectious or contagious disease has reached such proportions as in the judgment of the board would render it safer and better to take such action. Ordinarily the appearance of a few cases of scarlet fever, for instance, in a town does not require the closing of the schools. If an effectual quarantine is maintained over all existing cases, they cannot endanger the schools.

At least four weeks ought to intervene after a case of scarlet fever before any member of the family be allowed to attend school. In some cases the period should be much longer, depending, as above stated, upon the time required to complete desquamation.

Practically the same rules apply to diphtheria.

In regard to measles, the only regulations adopted by the State Board of Health are printed upon the placard.

If there are any points upon which you desire more information, it will be a pleasure to give it.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

BEDFORD, N. H., April 7, 1899.

Irving A. Watson, M. D., Concord, N. H.:

DEAR SIR,—I want to ask you about the posting of these contagious diseases, scarlet fever, diphtheria, measles, etc. After the doctor notifies the board of health, and they placard the house, how long shall the card remain, and who shall say when the card shall be taken down? Is there a stated time to leave the card up, or what is to be done about it?

Now I have in mind a mild case of scarlet rash: The rash showed well for two or three days; child about two years old; fever not over 101 at any time; child played about most of the time; had a slight sore throat, but nothing to prevent his eating all right. The child's skin has begun to come off some; feeling all right every way. There is not a doubt but it is scarlet fever. I have had three such cases in my practice. The cards have been up about two weeks, and some of the patients are so they go out, but not on my orders. They have written me to have the cards removed, and I want to know what is the thing to do, and to whom it belongs to order the cards taken down. If you have any printed matter about this, please send it to me. If you have not, write me what is right about it.

I remain, yours truly,

(Signed) JOSEPH TAYLOR, M. D.

STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
CONCORD, N. H., April 8, 1899.

Joseph Taylor, M. D., Bedford, N. H.:

DEAR DOCTOR,—In reply to your favor of April 7 I would say that after scarlet fever, diphtheria, etc., is reported to the local board of health, the latter should immediately placard the infected premises, see that the regulations relating to isolation are enforced, that the family does not suffer from lack of supplies, etc., and should remove the card when the board is satisfied that there is no longer any necessity for keeping it up.

In order to ascertain the latter fact, most boards of health take the advice of the attending physician, or, if the case has been dismissed or there has been no physician in attendance, the physician on the board of health may properly ascertain the facts. There can be no absolute time limit fixed for the isolation of individual cases. Of course you understand that in scarlet fever there is danger of infection until desquamation has been completed and the premises disinfected. In some instances desquamation is rapid, in others slow, therefore it would be better to determine by medical examination just how long each case should be isolated.

The mild cases, such as those to which you refer, are just the ones that more commonly spread the disease. In the cases alluded to, I think you should, as health officer, make a personal inspection, and then act as your judgment may suggest.

I send you some printed matter under separate cover.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., August 3, 1899.

Board of Health, Bedford, N. H.:

GENTLEMEN,—Information has been received by this board to the effect that scarlet fever has existed for a considerable time in epidemic form in your town, and that the rules and regulations relating to isolation, disinfection, etc., have not been effectually carried out. We are informed that the disease has spread with fatal results to other towns, through lack of enforcing the quarantine regulations.

We would respectfully call your attention to the fact that local boards of health are required to make weekly reports to the State Board of Health of the prevalence of contagious and infectious diseases in their town. Please give us a full statement of facts with respect to the prevalence of scarlet fever in Bedford.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

BEDFORD, N. H., August 14, 1899.

State Board of Health, Concord, N. H.:

GENTLEMEN,—Yours of the 3d received, and would have answered before but have been looking up the complaint. I have found out about the case and the board of health was not to blame about that case. The town here does not seem to be inclined to assist the board at all, only to find fault, particularly if there is anything to be done where there is any money to be paid out. Now, then, in the case that I refer to, the man was at work at a Mr. Holbrook's, and we told him to stay away and not go into his house while the children were sick. He lives about four miles from here, near the Amherst line. Well, we could not be there all the time, and he went home. I saw him, and he said that Mr. Holbrook's folks were willing he should go home on Saturday nights, and were not afraid of the disease. I hear the fatal case came from that source. Now, how are we to blame? We furnished food for his family, and there was no need of his going home. If we were to blame, I do not see it. I don't think a board of health can put a guard around the houses in this town and keep them there and expect the town will pay for it, for they will not. They found fault because we sent some food to that family after shutting them up, and the same in one other place. I think we have done as well as any one could do under the circumstances, and we think it is as well as any one could do if they were in our places.

Yours, etc.,

(Signed) BOARD OF HEALTH.

MANCHESTER, N. H., August 16, 1899.

Irving A. Watson, M. D., Secretary State Board of Health, Concord, N. H.:

DEAR SIR,—We have learned through responsible parties that scarlet fever is quite prevalent in the town of Bedford, and that the quarantine rules are not properly enforced, the health officer being negligent in this respect. It is said that a placard is often removed in one week's time, and that patients are allowed to mingle freely with other people during the period of desquamation, and also to pick berries which are afterward sold in this city. As these are frequently eaten without being cooked, we consider such distribution to be a source of danger. We would ask, therefore, that you make

some investigation of the matter, and take whatever action may seem to you advisable.

Very truly yours,

(Signed) WILLIAM K. ROBBINS,
Clerk.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H.

Board of Health, Bedford, N. H.:

GENTLEMEN,—We are in receipt of complaints from several sources, and from two towns outside of Bedford, alleging that your board of health has been entirely remiss in its duties in the management of contagious and infectious diseases, scarlet fever in particular. One of the complaints states that "there has been an epidemic of scarlet fever in Bedford since last fall; that quarantine laws are very little enforced, and that practically very little scientific effort has been made to stop the disease."

We have also received a complaint from Manchester, stating that scarlet fever has been quite prevalent in Bedford, and that the quarantine rules are not properly enforced; that placards have been removed in a week's time, and that patients are allowed liberty while in the period of desquamation, and that such convalescents have picked berries to be sold in Manchester.

We are also informed that, by reason of laxity in the enforcement of these rules and regulations, one person at least, "a lovely little girl of six years," lost her life. It appears that scarlet fever existed in the family of one John Dixon, of Bedford, and that he was allowed to work for a Mr. Ralph Holbrook, in Amherst, returning, whenever it pleased him, to take care of his children nights. The little girl, mentioned, at this time visited in the Holbrook family, they being relatives, and there contracted the disease, brought to the family, doubtless, by Dixon.

Your letter of August 14 would seem to be practically an admission of some, if not all, of the charges against your board. In regard to the disease at Dixon's you say, "We told him to stay away and not go into his house while the children were sick. He lives about four miles from here, near Amherst line. Well, we couldn't be here all the time, and he went home. I saw him and he said that Mr. Holbrook was willing he should go home on Saturday nights, and wasn't afraid of the disease."

Why did you not enforce the regulations? Why did you permit Mr. Dixon to carry the disease into the Holbrook family, when you were aware of the facts? Why did you not prosecute Dixon promptly for a violation of your orders when you found out that he was not complying with the regulations? It cannot be that you supposed he had a right to carry the disease into Mr. Holbrook's family simply because they were not afraid of it.

It is not to be presumed that you would remain at Mr. Dixon's house to watch the actions of the family; but it is your duty to prosecute in case of flagrant violation of the law, such as this, as soon as it comes to your notice.

You say "The town here don't seem to be inclined to assist the board of health at all, only to find fault." "I don't think that a board of health can put a guard round the houses in this town and keep them there, and expect that the town will pay it, for they will not. They found fault because we sent some food to that family after shutting them up, and the same in one other place." It is more charitable to believe that these remarks are inspired through ignorance of the legal authority with which your board is invested, rather than from a morbid fear of what people will say. The people of Bedford have no more authority in directing what your board shall do (except by vote of the town at a legal meeting) than have the people of Concord. Your duties are specifically defined by laws and regulations, and cannot be set aside by the people of Bedford. The town is obliged to pay your board for services and for all necessary expenses incurred in the performance of your duties. You are the guardians of the public health interests of your town, so made by authority of the state, with definite laws to enforce and certain rules and regulations to follow, and these should be your guide in every instance, independently of what your neighbors think or say. The prosecution of Dixon for violation of regulations was not only your duty, but it would have forever set at rest the question of your authority in such cases in Bedford.

A board of health, under the Public Statutes of New Hampshire, has almost unlimited authority in the restriction and prevention of infectious and contagious diseases, and the town is obliged to pay the bills. Indeed, there is a law (section 20, chapter 108) which compels selectmen to advance to the board of health such sums as may be necessary to meet all expenses incurred in the performance of their duties.

If this letter seems emphatic, it is so because the statements given to this board indicate that there has been a glaring

failure in the proper management of contagious and infectious diseases in your town. If there is any other view to take of the situation we should be glad to have it presented. We do not wish to do any one an injustice; but, on the other hand, we desire that every health officer shall do his duty, and that no means shall be spared to prevent the spread of these diseases.

Our board will at any time gladly co-operate with you to the fullest extent in work of this kind, and in the performance of your duty are ever ready to defend your board against public criticism.

We send to you under separate cover, for each member of your board, copies of the public health laws of the state, pamphlets on the prevention and restriction of scarlet fever, the prevention and restriction of diphtheria, the prevention of typhoid fever, laws, rules and regulations for the prevention and restriction of epidemic diseases, and blanks necessary for reporting to this department.

We respectfully request that in the future the laws and regulations relative to the restriction and prevention of contagious diseases be enforced.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

Separate cover.

MEASLES.

The death records of New Hampshire show that during the past fifteen years there have been more than three hundred deaths in this state from measles. It will, therefore, be seen that it is not so trivial a malady as many people imagine.

There has been more or less question in some localities as to the advisability of taking any precautions to prevent the spread of this disease. There are differences of opinion on this point among practical health officers. It is, however, believed by a large number of public health officials, who have given the matter their closest attention, that through quarantine and disinfection the disease has been, and may be, greatly reduced.

Upon this subject, Prof. C. A. Lindsley, M. D., of Yale College, and secretary of the State Board of Health of Connecticut, and who is widely known as a sanitarian, says:

"It is a serious error, and very widespread in the public mind, that measles is a comparatively trivial disorder, and the precautions to prevent its spread are unimportant and not worth the trouble. To show the fallacy of this belief, and how dangerous it is to act upon it, it is only necessary to refer to the published report of vital statistics.

"In the last four years, there were only 239 deaths from scarlet fever, in Connecticut, while there were 427 deaths from measles. Yet both diseases have been prevalent through the state all that time.

"In the report of the registrar-general of England, for the decade 1888 to 1897, the deaths from scarlet fever numbered 57,226, while those from measles were 128,043; more than double the mortality of scarlet fever.

"The report of the registrar-general of Ireland for the same period is similar,—scarlet fever, 5,272; measles, 8,842. It is true, the direct mortality from measles is not large in proportion to the whole number ill with it, but it has been observed for generations that following an epidemic of measles there is always an increased mortality from pneumonia, bronchitis, and consumption. Is it a trivial disease that destroys more lives in ten consecutive years throughout both England and Ireland than the united victims of scarlet fever and diphtheria? Deaths from measles in those countries were 136,885. Deaths from scarlet fever and diphtheria together, in England and Ireland, during the same ten years, were 135,681.

"From these facts it must be conceded that measles is not a trivial malady, but that its importance as a factor in public health ranks well up among the most dangerous diseases.

"Is it a preventable disease? Yes. Inasmuch as its continued prevalence depends upon contagion, it is preventable. But it is not so easily prevented as some other diseases. Its prevention and restriction depend much upon the ready and willing co-operation of parents and physicians.

"It is a highly contagious disease in every stage of its progress. Hence its seed is often sown in a community before its presence even is suspected. In its incipient stage, although already infectious, it presents no distinctive characteristics to

justify a positive diagnosis. It then apparently differs in no respect from a common "cold," affecting the mucous surfaces of the nose, eyes, and lungs. It is not until the eruption appears that the diagnosis is confirmed. During that period of from two to four days, the patient is not usually restricted in his liberty, but associates freely with his school-fellows and others, and plants an epidemic. The control of measles, therefore, is largely dependent upon the prudent care of *suspected* cases.

"Physicians should not hesitate to acknowledge that they cannot identify measles before the eruption is seen. Parents should not send their children to school or to their neighbors if suffering with a recent cough, watery eyes, and a nasal catarrh; and teachers should be instructed to exclude pupils with such symptoms from the schoolrooms, and send them home.

"Primary cases of measles should be cared for as vigilantly as smallpox. Isolation and disinfection should be practiced unremittingly, and a placard should be placed upon the entrance of every house in which there is a case. The numerous instances related in the annual reports of the local health officers in this state prove that the spread of measles can be controlled in large degree, if the primary cases are taken care of. But when an epidemic has become general in a community, quarantining of all the cases will be impossible."

The only regulation that has been required upon the appearance of measles in this state, or, rather, that has been recommended by the State Board of Health, consists in placarding the infected house as follows:

MEASLES.

Any person having measles, however mild the case may be, and all persons in a family where measles exists, except those who have had the disease, are forbidden to attend school or any public or private gathering, or to mingle with persons who have not had the disease.

Persons who have not had measles are prohibited from entering these premises.

All persons are strictly forbidden to remove this card without orders from the board of health.

Any violation of these regulations will be punished to the fullest extent of the law.

BOARD OF HEALTH.

The utility of placarding and of enforcing the regulations above cited is recognized in nearly all localities in the state, and it is believed that much has been done toward restricting the disease by enforcing these rules.

It has not been the general practice, if it has been done at all, to fumigate premises after the convalescence of patients. It is the general belief of health officers having to deal with measles that the infection is of such a volatile or short-lived nature that it is practically destroyed by the time the patient has recovered from the disease.

It is the practice in the city of Concord to placard infected houses, allowing the card to remain two weeks, unless some notice to the contrary, such as the appearance of another case in the family, from the attending physician. The health officer then visits the house, takes such action as he deems best (usually nothing more than the removal of the card), and suspends the regulations.

The following correspondence may be interesting and instructive in connection with this disease:

STRATHAM, N. H., July 2, 1900.

State Board of Health:

GENTLEMEN,—We are about to have an outbreak of measles in town. We have a few cases now, and I am in doubt just how to treat them. Will you mail me the laws bearing on the subject; also some cards for the various diseases you quarantine?

I think, myself, that it is useless to try to stamp out measles, as it is given before the party giving the disease knows he has it, and I find that some physicians hold the same views. One prominent doctor of Exeter went so far as to say that it was an unkindness for parents to keep their children away from exposure to the disease.

The circumstances of the case are as follows: At the children's Sunday celebration the minister's wife and child were

coming down with measles; they attended the service, not knowing that they had the disease. A few days after they sickened, and a doctor pronounced it measles. We already have cases that we can trace to that exposure, and probably shall have more.

Yours respectfully,

(Signed) GEORGE E. GOWEN,
Member Board of Health.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., July 3, 1900.

George E. Gowen, Member Board of Health, Stratham, N. H.:

DEAR SIR,—Your favor of July 2 is at hand and contents noted. There is a difference of opinion as to what can be done to restrict the spread of measles. It is true that this is a disease which is communicable in its earliest stages—even before it can be recognized—and at such a time it is often widely spread in a community or in the schoolroom.

However, the best sanitary authorities agree that the disease may be very largely restricted by local boards of health, particularly when the disease first appears. In an instance such as you mention, where a minister's wife and child have given the disease to a whole community by attending church services, it might be very difficult to carry out any restrictive measures that would be of avail. So far as this board is concerned, we are now leaving this matter largely to the judgment of the local board of health.

The "prominent doctor of Exeter," who "went so far as to say that it was an unkindness for parents to keep their children away from exposure to the disease," could have had little or no knowledge of the fatality of the disease, and his opinion is to be condemned *in toto*. During the past fifteen years over three hundred children have died in New Hampshire from measles. It cannot be regarded as a trivial malady.

We have no special literature on this subject for distribution. There will be a short article on measles in the next issue of the Sanitary Bulletin.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

MILTON, N. H., May 18, 1900.

Irving A. Watson, M. D., Secretary State Board of Health, Concord, N. H.:

DEAR DOCTOR,—Would you kindly inform me what is your recommendation relating to the prevention of the spread of measles? Literature from the state board is incomplete for guidance in this matter. In looking up authority I find the rules laid down in Hare's "System of Therapeutics" much less exacting than those by Williams in Stedman's "Twentieth Century Practice." We are having occasional cases in this town this spring, and I am, of course, anxious to keep the disease in at least such control as not to affect the scholars.

Fraternally,

(Signed) M. A. HART, M. D.,
For Board of Health.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., May 24, 1900.

M. A. Hart, M. D., Chairman Board of Health, Milton, N. H.:

DEAR DOCTOR,—In reply to your favor of recent date, I would say that the State Board of Health has never issued any regulations in regard to measles other than is printed upon the placard issued from this office.

I am aware that there is a difference of opinion as to how far restrictive measures should be carried, and to what extent they are practicable and of value.

The regulation referred to should be enforced as far as possible by the local board of health. Of course a local board has the undoubted right to make such additional rules and regulations as it may deem advisable. Measles is a most difficult disease to restrain, for the reason that it is infectious in its earlier period, as you know, and it is often communicated to others before it is recognized. We are of the opinion that if the regulations referred to were more strictly enforced when the disease first appears, it might be restricted to a very large extent; but after the infection has become general throughout a village, the matter seems to be almost beyond the control of a local board of health.

We expect a local board of health to use its judgment, largely, in the matter as to what should be or may be done in addition to the regulations referred to. I do not think it necessary to

close schools on account of this disease, unless it has become so general that the schools are almost certain to be infected.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

CORNISH, N. H., June 25, 1900.

Irving A. Watson, Esq., Secretary State Board of Health, Concord, N. H.:

SIR,—I wish you would send me the Sanitary Bulletin regularly. I have the April, and would like the January, number. Also, if you prepared a report for the year 1899, I would like a copy. I have Vol. XV, 1897-98.

We have been having quite a run of measles this spring. There is quite a varied opinion as to how thorough we should be, whether we should quarantine the whole family, how long, and whether the whole house and all in it needs disinfecting. It looks unnecessary.

Also in typhoid fever, should the family be compelled to stay in and others keep out?

If a family quarantined are well-to-do and amply able to furnish their own supplies, pay doctors' bills, for disinfectants, etc., is the board obliged to furnish these at the expense of the town?

As a general thing, the town of Cornish requires but little attention from the board of health, but it is necessary to be posted, as once in a while we have a case. There was nothing in 1899 to require our attention.

Any other information you may think of will be gladly received.

Respectfully yours,

(Signed) FRANK H. WELD,
Member Board of Health.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., June 26, 1900.

Frank H. Weld, Chairman Board of Health, Cornish, N. H.:

DEAR SIR,—Your favor of June 25 is at hand. It will be a pleasure to send the Sanitary Bulletin to you regularly. I send the January number under separate cover. The July number will be out in the course of two weeks.

Reports of this board are issued only once in two years, therefore the report for 1899-1900 will be made to the next legislature.

In regard to measles, the only regulation promulgated by the State Board of Health concerning this disease is printed upon the placard sent out by this board. Local boards of health have the right to take additional precautions if they deem it advisable. We think, ordinarily, if the regulations referred to are complied with, that will be sufficient.

In typhoid fever there should be no quarantine. The board of health may or may not placard the house, as it deems best. Sometimes it is wise to do so, simply to inform the public that there is illness on the premises and to keep callers away; but this is not necessary so far as the disease is concerned. If proper precautions are taken in the sick-room in regard to disinfection, etc., there is practically no danger of contracting the disease from the patient.

As to whether the board of health shall assist a family in quarantine depends entirely upon circumstances, and that is left wholly to the judgment of the local board of health, as you will see by the law, a copy of which you will find in the Bulletin.

It is customary for the board of health to furnish disinfectants, and the work of disinfecting premises should not be left to others. It is considered to be economy for the town to furnish the disinfectants.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

AID TO PERSONS QUARANTINED.

It sometimes becomes necessary to assist a family when quarantined on account of scarlet fever, diphtheria, etc., by reason of its being deprived of the opportunity to earn wages, or from other causes, and to provide for which the following law was enacted by the last legislature, and approved March 11, 1899:

SECTION 1. Whenever any person or family is placed in quarantine by a board of health, to protect the public against smallpox, scarlet fever, diphtheria, or any other dangerous infectious or contagious disease, it shall be the duty of said board to assist such person or family while in quarantine in such manner as in the judgment of the board may be deemed wise or necessary.

SECT. 2. All expenses thus incurred, or such part thereof as the board may determine, shall be deemed a legitimate expenditure for the protection of the public health and shall be charged to the account of incidental expenses, but not to any indigent or pauper account, nor shall such expenditure be construed to mean a public aid to the person or persons so quarantined and assisted, unless such person or persons are already paupers as defined by the Public Statutes.

SECT. 3. All acts and parts of acts inconsistent with this act are hereby repealed, and this act shall take effect upon its passage.

The above law would seem to solve, in a thoroughly satisfactory way, a question which heretofore has been considerable of a problem in some localities. The entire matter is left to the judgment of the local board of health, and whatever aid the board may deem to be wise and necessary to extend to the families in question must be paid by the town and charged up as provided for in section 2.

The opinion of the board of health of the city of Concord upon this law is as follows:

"The above act received the signature of the governor March 11, and in the brief time this law has been in operation, its necessity has been made manifest through the good we were enabled to do in relieving the pressing wants of those who, under ordinary circumstances, were competent to provide for themselves, but, when embarrassed by quarantined illness, found it impossible to keep even with the world without receiving aid from the city or county. When the main and, usually, the only wage-earner of the family was stricken down, or compelled to remain at home to assist the others, or, when feasible, permitted after proper precautions to leave home and board outside, the income of that family was altogether cut off or appreciably decreased while the expenses were at the same time largely increased. It is in this class of cases the wisdom of the law stands out in all its brightness and guarantees kindly assistance to those who are isolated, in order that the greatest good to the greatest number may be attained."

THE PREPARATION AND TRANSPORTATION OF DEAD BODIES.

The preparation and transportation of dead bodies has for a long time given serious trouble to all persons and parties who have had anything to do with the matter. It has been a source of annoyance, as well as of danger, to railroad employees, owing to the improper manner in which bodies in many instances were prepared for shipment. Serious complaints were made by transportation agents everywhere. Sometimes bodies received in what appeared to be good condition became very offensive before their destination was reached, and in some instances fluids were found to be oozing from the box in which the body was shipped.

A general protest was made by the railroads against such negligent and improper preparation, and an urgent request was made for some law that would put a stop to this dangerous and disagreeable practice.

Not only was this a serious matter to transportation companies, but frequently more so to the friends of the deceased. These results were due chiefly to the ignorance, indifference, or inability of the person who acted as undertaker to prepare the body as it should have been. Not a few persons had set themselves up as undertakers who were totally incompetent to perform properly the duties of such an office. There was no law in existence to prevent any person from shipping a dead body.

There being no law upon this subject, the State Board of Health some years ago was obliged to issue an order prohibiting the transportation of bodies dead of scarlet fever, diphtheria, etc.

As an illustration of the position taken by the railroads on this subject, we present herewith some correspondence, which was, indeed, a factor in leading up to the enactment of the present law to regulate the practice of embalming and the transportation of dead bodies:

NEW ENGLAND PASSENGER ASSOCIATION,

BOSTON, Mass., December 30, 1898.

Dr. I. A. Watson, Secretary State Board of Health, Concord, N. H.:

DEAR SIR,—A matter which has engaged the attention of the railroad officials in the passenger department for a considerable time has been that of the transportation of corpses, and the effort of these officials has been, first, to transport such bodies with safety to the passengers; and, second, to comply with the wishes of the friends desiring such bodies transported in the baggage cars.

For the safety of the public it is conceded that corpses of those who have died of contagious or infectious diseases should not be carried, except after suitable preparation by persons qualified in such business, as evidenced by the laws in different states prohibiting such carriage, sometimes absolutely, and in others under certain restrictions, such as inclosing the bodies in sealed or metallic cases. It has been a matter of considerable difficulty on the part of the railroad officials to ascertain whether bodies are of the objectionable kind, or, if they are, if they have been properly prepared; the laws in the different states regarding what is to be done and under whose supervision, being inefficient or varying very materially.

It is the desire of the lines represented in this association to present the matter to your board, with a view to securing your action in obtaining uniform laws governing the transportation of dead bodies in the baggage cars in the different states, so that the transportation companies may be governed practically by the same laws and enabled to so instruct their employees in the different states.

That some action in this direction is desirable we have no doubt you will readily agree, and it is called to your attention at this time in the hope that the boards of health in the different states will take such steps to secure the necessary legislation this winter. In the opinion of the members of this association, the accompanying extract from the laws of the state of Vermont will amply cover the requirements, and if enacted in the other states, will establish a uniform practice which will be very greatly in the interest of the health of the community, as, with uniform rules and laws requiring adherence to them, there will be no difficulty, so far as the transportation companies are concerned, in preventing the transportation, or at least the placing in the baggage cars of the railroad trains, the

bodies of persons who have died of contagious or infectious diseases, thereby subjecting the clothing of every passenger on the train to the danger of infection.*

The assistance of the railroads, so far as it is necessary in securing legislation to this effect, will be cheerfully rendered, but we feel that the requirements are so apparent that in bringing it to the attention of your board, we have put the question in such hands as will have it immediately enacted.

We shall be pleased to hear from you in regard to the matter.

Very truly yours,

(Signed) N. E. WEEKS,
Chairman.

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., January 4, 1899.

N. E. Weeks, Chairman New England Passenger Association, 67 Federal Street, Boston, Mass.:

MY DEAR SIR,—I am in receipt of your favor of December 30, in relation to the transportation of corpses. In reply I

* "The bodies of persons who die of smallpox, Asiatic cholera, typhus fever, or yellow fever, shall be wrapped in a sheet saturated in a solution of a half pound of chloride of zinc in a gallon of water, or a solution of bi-chloride of mercury of not less than two per cent strength, inclosed in a proper coffin or box, and buried immediately, with as little publicity as possible. Such bodies shall not be put into a hearse or public vehicle, or removed from town to town, or brought into the state.

"The bodies of those who die of diphtheria, scarlatina, or typhoid fever, shall be buried with as little delay and publicity as possible; but if prepared as prescribed in the preceding section, and incased in an air-tight zinc, copper, or lead lined coffin, or in an air-tight iron casket, and inclosed in a strong wooden box, with the space between the coffin and the box filled with sawdust saturated with one of such solutions, may be removed and transported, provided the health officer furnishes a certificate of the cause of death, and the undertaker an affidavit as to how the body has been prepared and incased, and the health officer of the town-village, or city to which the body is consigned consents to its receipt. If a person violates the provisions of this and the preceding section he shall be fined not more than fifty dollars and not less than ten dollars.

"The dead body of a person shall not be delivered for transportation or transported in this state, except as provided in this chapter, unless it is accompanied by a certificate, signed by a physician legally qualified to practice medicine and surgery in this state, or by the attending physician, if the person died out of the state, stating that such person did not die of smallpox, Asiatic cholera, typhus fever, yellow fever, diphtheria, or scarlatina.

"A person or corporation violating the provisions of the preceding section shall be fined not more than three hundred dollars and not less than fifty dollars."

would say that I have recently given this subject considerable attention, and have corresponded with the state board of health of nearly every state in the Union, for the purpose of securing uniform regulations, blanks, etc. It is certain that a great deal of trouble, difficulty, and annoyance connected with the transportation of dead bodies might be obviated if uniformity in rules and regulations could be secured throughout the country.

You doubtless know that this matter has within a year or so been taken up anew by the National Association of General Baggage Agents, the National Funeral Directors' Association, and the National Conference of State and Provincial Boards of Health, and at a joint conference of the committees from these several organizations a series of rules was adopted and recommended for the transportation of the dead. I take pleasure in inclosing herewith a copy of the regulations referred to.

These regulations, with a slight modification of the embalmers' clause, have been adopted by quite a number of states, and are likely to be by several more. Indeed, these rules have already received such extensive approval that it is not probable that a general uniform system could now be established unless it conformed closely to the rules referred to.

The rules referred to have been literally, or in substance, adopted by Indiana, Illinois, Minnesota, Iowa, Michigan, Mississippi, New Jersey, Pennsylvania, West Virginia, and perhaps some other states. Wisconsin has a statutory enactment, but I am informed by the secretary of the state board of health that the regulations will probably be enacted into a law at the next session of the legislature of that state.

I call your attention to these facts in order to show you how extensively the regulations have already been adopted. The Vermont law is not materially different in its requirements from the regulations referred to, and might easily be amended so as to conform to the rules.

This matter is now under consideration in our board, and the rules will probably be adopted at an early date.

I take it that the rules are framed, first, in the interests of public health; second, for the protection of railway employees; and, third, to comply, as far as is possible with safety, with the wishes of the friends of the dead.

After making many inquiries of railroad men, I am confident that stringent rules are necessary, for bodies are often shipped in a condition wholly unfit for transportation. It seems to me that the matter is now so well formulated and discussed that it is within the power of your association prac-

tically to compel the adoption of these rules by every state, provided the railway associations are satisfied with them.

The State Board of Health of New Hampshire has ample power to enforce any regulation it may deem best for the public good, through the local boards of health; but it would doubtless be better to have some direct legislation upon the subject, either to enact the regulations desired into a law, or to authorize the State Board of Health to formulate such regulations as it might deem necessary, such regulations to have the force of law when officially adopted and publicly promulgated.

We are glad that the New England Passenger Association, of which you are chairman, has taken this matter in hand, and we should be glad to hear from you further in regard to the matter.

I also inclose a blank transit permit which has been adopted by several states.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

At the last session of the legislature a bill was introduced to provide for the registration and examination of embalmers, and to control the transportation of the dead. The bill first introduced, and, in fact, the whole subject, was given a hearing before the committee on public health, the result being that the committee recommended, in a new draft, the following bill, which became a law:

THE STATE OF NEW HAMPSHIRE.

LAW REGULATING THE PRACTICE OF EMBALMING AND PROVIDING FOR RULES RELATING TO THE TRANSPORTATION OF THE DEAD.

AN ACT TO REGULATE THE PRACTICE OF EMBALMING.

Be it enacted by the Senate and House of Representatives in General Court convened:

SECTION 1. Every person who shall, on the passage of this act, be engaged in the practice of embalming human bodies in this state and shall desire to continue in that business, must, before the first day of September, 1899, register his name, age, length of time in the business, and place of residence with the State Board of Health, and shall receive a certificate certifying that he is a registered embalmer.

SECT. 2. Any person other than a registered embalmer, who desires hereafter to carry on the business of embalming in this

state, shall pass an examination before the State Board of Health, and shall then receive a certificate as a licensed embalmer.

SECT. 3. Examinations for licenses shall be given by the State Board of Health at least twice annually, at Concord, and they shall be in writing and in English. The examination papers shall contain such questions relating to the subject of embalming as the State Board of Health may deem necessary to determine the qualifications of the applicant for the business, and if found qualified, a certificate, as provided for in section 2 of this act, shall be granted him.

SECT. 4. The State Board of Health may adopt such blanks and forms of procedure as it may deem necessary and best to carry out the provisions of this act, and it shall keep on file a list of all registered and licensed embalmers, and a record of examinations, together with the examination papers, all of which shall be open to public inspection. The said board may, whenever it deems such action necessary for the protection of the public health, establish regulations to govern the preparation and transportation, by rail or otherwise, of all bodies dead of an infectious, contagious, or other disease, and it shall have the power to revoke, for good and sufficient cause, any license it may have issued.

SECT. 5. No person shall embalm a body, or inject into any cavity of a body of any person that has died from an unknown cause any fluid or substance, without a legal certificate of death, or permission of the attending physician, and if a criminal cause is suspected, not until after a legal investigation has determined the facts. No person who has not passed the required examination shall have the right to represent himself as a licensed embalmer.

SECT. 6. Any person who violates any of the provisions of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not more than one hundred dollars, or be imprisoned not more than six months, for each offense.

SECT. 7. The fees for registration under this act shall be one dollar, and for examination five dollars, and from the money thus received shall be deducted the expenses for printing, stationery, postage, etc., necessarily incurred under the provisions of this act, and the balance shall be turned into the state treasury, together with a certified statement of all receipts and expenditures.

SECT. 8. All acts and parts of acts inconsistent with this act are hereby repealed, and this act shall take effect upon its passage.

[Approved March 11.]

The State Board of Health, at a meeting held on June 8, 1899, took into consideration the above quoted law and gave it due and careful consideration. Under the provision of section 4, the board regarded its authority complete to establish such rules and regulations as it deemed wise and necessary in connection with the transportation of dead bodies.

During the past few years concerted effort has been made, and regulations adopted in many localities, to secure uniformity in methods employed in the shipment of dead bodies throughout the United States, Canada, and Mexico. To secure this result, meetings of a joint committee of the American Public Health Association, National Conference of State and Provincial Boards of Health of North America, National Association of General Baggage Agents, and National Funeral Directors' Association were held from time to time, and the following regulations were finally formulated and agreed upon, and these, at the meeting above referred to, were adopted by the New Hampshire State Board of Health:

THE STATE OF NEW HAMPSHIRE.

STATE BOARD OF HEALTH.

OFFICE OF THE SECRETARY.

OFFICIAL ORDER CONCERNING THE TRANSPORTATION OF THE DEAD.

(In force on and after January 1, 1900.)

To Health Authorities, Transportation Officials, Undertakers, and Others Whom it May Concern:

At a meeting of the State Board of Health of the state of New Hampshire, held in the city of Concord, June 8, 1899, the following rules governing the transportation of dead bodies in New Hampshire were adopted, to take effect January 1, 1900:

RULE 1. The transportation of bodies dead of smallpox, Asiatic cholera, yellow fever, typhus fever, or bubonic plague, is absolutely forbidden.

RULE 2. The bodies of those who have died of diphtheria (membranous croup), scarlet fever (scarlatina, scarlet rash), glanders, anthrax, or leprosy shall not be accepted for transpor-

tation unless prepared for shipment by being thoroughly disinfected by (*a*) arterial and cavity injection with an approved disinfectant fluid, (*b*) disinfecting and stopping of all orifices with absorbent cotton, and (*c*) washing the body with the disinfectant, all of which must be done by a *licensed embalmer*, holding a certificate as such, approved by the State Board of Health. After being disinfected as above, such body shall be enveloped in a layer of cotton not less than one inch thick, completely wrapped in a sheet and bandaged, and incased in an air-tight zinc, tin, copper, or lead lined coffin, or iron casket, all joints and seams hermetically soldered, and all inclosed in a strong, tight wooden box. Or, the body being prepared for shipment by disinfecting and wrapping as above, may be placed in a strong coffin or casket, and said coffin or casket incased in an air-tight zinc, copper, or tin case, all joints and seams hermetically soldered, and all inclosed in a strong outside wooden box.

RULE 3. Bodies dead of typhoid fever, puerperal fever, erysipelas, tuberculosis, and measles, or other dangerous communicable diseases, other than those specified in Rules 1 and 2, may be received for transportation when prepared for shipment by filling cavities with an approved disinfectant, washing the exterior of the body with the same, stopping all orifices with absorbent cotton, and enveloping the entire body with a layer of cotton not less than one inch thick, and all wrapped in a sheet and bandaged, and incased in an air-tight coffin or casket; *provided*, that this shall apply only to bodies which can reach their destination within forty-eight hours from time of death. In all other cases such bodies shall be prepared for transportation in conformity with Rule 2. But when the body has been prepared for shipment by being thoroughly disinfected by a *licensed embalmer*, holding a certificate as in Rule 2, the air-tight sealing may be dispensed with.

RULE 4. Bodies dead of diseases that are not contagious, infectious, or communicable may be received for transportation when incased in a sound coffin or casket and inclosed in a strong outside wooden box; *provided*, they reach their destination within thirty hours from the time of death. If the body cannot reach its destination within thirty hours from time of death, it must be prepared for shipment by filling cavities with an approved disinfectant, washing the exterior of the body with the same, stopping all orifices with absorbent cotton and enveloping the entire body with a layer of cotton not less than one inch thick, and all wrapped in a sheet and bandaged, and

incased in an air-tight coffin or casket. But when the body has been prepared for shipment by being thoroughly disinfected by a licensed embalmer, holding a certificate as in Rule 2, the air-tight sealing may be dispensed with.

RULE 5. In cases of contagious, infectious, or communicable diseases, the body must not be accompanied by persons or articles which have been exposed to the infection of the disease, unless certified by the health officer as having been properly disinfected; and before selling passage tickets agents shall carefully examine the transit permit and note the name of the passenger in charge, and of any others proposing to accompany the body, and see that all necessary precautions have been taken to prevent the spread of the disease. The transit permit shall specifically state who is authorized by the health authorities to accompany the remains. In all cases where bodies are forwarded under Rule 2, notice must be sent by telegraph to the health officer at destination, advising the date and train on which the body may be expected. This notice must be sent by or in the name of the health officer at the initial point, and is to enable the health officer at destination to take all necessary precautions at that point.

RULE 6. Every dead body must be accompanied by a person in charge, who must be provided with a passage ticket and also present a full first-class ticket marked "corpse" for the transportation of the body, and a transit permit—showing physician's or coroner's certificate, health officer's permit for removal, undertaker's certificate, name of deceased, date and hour of death, age, place of death, cause of death, and, if of a contagious, infectious, or communicable nature, the point to which the body is to be shipped, and when death is caused by any of the diseases specified in Rule 2, the names of those authorized by the health authorities to accompany the body. The transit permit must be made in duplicate, and the signatures of the physician or coroner, health officer, and undertaker must be on both the original and duplicate copies. The undertaker's certificate and paster of the original shall be detached from the transit permit and pasted on the coffin box. The physician's certificate and transit permit shall be handed to the passenger in charge of corpse. The whole duplicate copy shall be sent to the official in charge of the baggage department of the initial line, and by him to the secretary of the state or provincial board of health of the state or province from which said shipment was made.

RULE 7. When dead bodies are shipped by express the

whole original transit permit shall be pasted upon the outside box and the duplicate forwarded by the express agent to the secretary of the state or provincial board of health of the state or province from which said shipment was made.

RULE 8. Every disinterred body, dead from any disease or cause, shall be treated as infectious or dangerous to the public health and shall not be accepted for transportation unless said removal has been approved by the state or provincial health authorities having jurisdiction where such body is disinterred, and the consent of the health authorities of the locality to which the corpse is consigned has first been obtained; and all such disinterred remains shall be inclosed in a hermetically sealed (soldered) zinc, tin, or copper lined coffin or box. Bodies deposited in receiving vaults will be treated and considered the same as buried bodies.

RULE 9. All rules and parts of rules conflicting with these rules are hereby repealed.

It may be stated that the above rules and regulations have been adopted by some twenty states of the Union, although they have not gone into effect in all these states, owing to the fact that some changes in existing laws are necessary before they can be in force. However, they are in active operation in a large number of states.

It will be seen that the rules permit the shipment of bodies dead of any disease common to the state, and all under such reasonable regulations as will insure proper preparation and protection of the public.

In order to make it possible to ship bodies dead of certain diseases and under certain other conditions, it is necessary to employ embalmers who have passed an examination before the State Board of Health. The following explanatory circular announced the first examination for the certificate of licensed embalmer:

THE STATE OF NEW HAMPSHIRE.

STATE BOARD OF HEALTH.

STATE HOUSE.

CONCORD, N. H., October 5, 1899.

To Funeral Directors, Undertakers, and Embalmers:

On and after January 1, 1900, no person who has not become a *licensed embalmer* by passing the examinations required by

the State Board of Health will be permitted to issue a certificate for the transportation of bodies dead of certain infectious and contagious diseases, or under certain other specified conditions, as provided in the regulations adopted by said board. (See Rules 2, 3, and 4.)

The first examination will be held at the state house, Concord, on Tuesday, November 14, 1899, at 11 o'clock A. M. The examination will be in writing and will embrace the topics named from "*a*" to "*h*." The application for ticket of admission to examination, with the legal fee of five dollars, should be forwarded to the secretary of the board before the day of the examination. The tickets will be issued by number and the examination papers will also be designated by numbers, so that the reviewing examining committee will have no knowledge of whose papers they are marking, thus securing absolute impartiality in rating.

It will be distinctly understood that funeral directors, undertakers, or embalmers in the state of New Hampshire, who may decline to apply for, or who, applying for, fail to receive a license as provided for, shall not thereby be prohibited from carrying on, or in any way be embarrassed in the prosecution of their business, except that they shall not be permitted to prepare for transportation bodies dead from diphtheria (membranous croup), scarlet fever (scarlatina, scarlet rash), glanders, anthrax, or leprosy, or any other disease that may hereafter be prohibited; and such bodies unless prepared for shipment by a licensed embalmer shall under no conditions be received for transportation by any common carriers or in public conveyances.

It is hoped that all registered embalmers throughout the state will, as rapidly as possible, so qualify themselves as to be able to secure the certificate and title of *licensed embalmer* provided for, and thus be prepared to compete successfully with those who may be duly licensed by this board.

Subsequent dates of examination will be duly announced.

Per order,
IRVING A. WATSON,
Secretary.

Inclosed with the foregoing circular was the following:

RULES OF THE STATE BOARD OF HEALTH OF NEW HAMPSHIRE TO GOVERN THE PREPARATION FOR TRANSPORTATION OF BODIES DEAD OF CONTAGIOUS OR INFECTIOUS DISEASES.

I. It shall be the duty of every funeral director, undertaker,

or embalmer, who may wish to qualify as competent to prepare bodies dead of infectious or contagious disease for transportation by railway corporations, express companies, or other common carriers, to comply with the following requirements:

1. He shall make application to the State Board of Health for a license. If he is already a registered embalmer under the laws of this state, an application under his own signature shall be sufficient; but if not, the said application must be made upon the blank form issued by the board, requiring his signature to be made under oath.

2. The application shall be accompanied by a fee of five dollars ($5.00), which shall entitle the applicant to an examination as to his fitness for such special work.

3. The examinations will be in writing, upon properly prepared blanks, and will comprise the following general subjects:

a. The visceral anatomy and vascular system of the human body.

b. The action and comparative value of germicides.

c. Methods of embalming.

d. Precautions to be taken after embalming to insure safety in the transportation of bodies of those who have died of an infectious disease.

e. The meaning of "infection," "contagion," and "disinfection.

f. Bacteriology in relation to infectious and contagious diseases.

g. The signs of death and how determined.

h. Practical demonstrations on the cadaver when required.

i. Such other topics as the board may present from time to time.

Seventy-five per cent of satisfactory answers in a scale of one hundred shall be required to entitle the applicant to a license.

II. Examinations for license will be held in the city of Concord, under the direction of the State Board of Health, at least twice annually, at such time as may be determined by the board.

III. After the examination has been completed the State Board of Health will judge of the competence of the applicant, and if satisfactory the certificate of a *licensed embalmer* will be issued to him, under which he will have legal authority to prepare bodies dead of contagious or infectious disease for transportation, and to do any work coming within the province of his vocation.

IV. The State Board of Health has authority under the

law to revoke, for cause, any license it may issue, and the failure to comply with the law and the regulations of the State Board of Health shall be deemed sufficient provocation for the revocation of a license.

V. Bodies of those who have died from diphtheria (membranous croup), scarlet fever (scarlatina, canker rash), glanders, anthrax, leprosy, or certain other diseases, unless they can reach their destination within a certain number of hours after death (see special rules), can be prepared for transportation only by a *licensed* embalmer, as above provided for. The certificate of a *registered* embalmer will not be recognized in such cases.

VI. Any person who violates the provisions of the law or these regulations shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not more than one hundred dollars ($100.00), or be imprisoned not more than six months, for each offense.

Below are the questions given for the first examination, the answers to which were required in writing, seventy-five per cent of correct answers in a scale of one hundred being necessary for the applicant to pass:

EMBALMERS' EXAMINATION, NOVEMBER 14, 1899.

1. What is embalming?
2. Name the cavities used in embalming.
3. What organs are contained in them?
4. Name the principal arteries used in embalming, and where located.
5. How would you draw blood from a dead body?
6. How would you do a job of cavity embalming?
7. Describe how arterial embalming is done.
8. How would you prepare a body dead of diphtheria for shipment?
9. After embalming what precautions, in infectious diseases, would you take to prevent the disease from being communicated to others?
10. What is the meaning of "infection"?
11. What is the meaning of "contagion"?
12. What is the meaning of "disinfection"?
13. Name some of the disinfectants that you would use, and of what strength.
14. How would you disinfect a room, clothing, etc., after a case of diphtheria, if it became necessary for you to do so?

15. Name some of the germ diseases.
16. What are the signs of death?
17. How would you make an embalming fluid for a case of scarlet fever?
18. How would you remove discolorations from the face?
19. What do you consider an approved disinfectant for embalming?
20. What is a germicide? Name two.

This, perhaps, fairly illustrates the scope of the subsequent examinations, the entire object being to satisfy the board that the applicant is competent to perform all work required of him under the law and the regulations.

All railroads doing business in New Hampshire were notified of the adoption of the regulations referred to in a manner substantially as follows:

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., November 8, 1899.

Mr. George E. Bynam, General Baggage Agent, Fitchburg Railroad, Boston, Mass.:

DEAR SIR,—I inclose herewith a copy of the rules and regulations relating to the transportation of the dead, adopted by the New Hampshire State Board of Health, under an act passed at the last session of the legislature. How familiar you may be with what has been done in this direction, I do not know; therefore, permit me to say that these regulations are known as the "Nashville Rules," because they were agreed upon at Nashville, Tenn., by the joint committee representing the National Association of General Baggage Agents, the National Funeral Directors' Association, and the National Conference of State and Provincial Boards of Health. All of these organizations subsequently adopted the regulations at the annual meetings of their respective bodies. They were also adopted by the American Public Health Association. Since their promulgation they have been adopted by at least nineteen states of the Union, and will be adopted by several other states as soon as the necessary legislation can be accomplished.

I suppose that no organization has done more toward securing the adoption of these regulations than the National Asso-

ciation of General Baggage Agents, and therefore it is to be presumed that they are acceptable to the great railroad corporations of the country.

We have the necessary authority to put these regulations in complete working order in New Hampshire, which will not only result in a better protection to the public health, but will give an assurance to transportation companies that bodies presented for shipment have been so prepared that they can be taken with absolute safety, even though dead from contagious or infectious diseases. This latter result is accomplished by reason of prohibiting any person, except an embalmer who has passed the examination required by the State Board of Health, from offering such bodies for transportation. Bodies dead of the contagious and infectious diseases, and those which cannot reach their destination within forty-eight hours, will be offered only by licensed embalmers, who will in such cases use the yellow blank, which will be furnished by this board especially for such cases. The white blank will be used in all other cases, and by the ordinary undertaker.

Bodies shipped under these rules will be received without question in any state in the Union.

Our board will furnish the white blanks to all undertakers in the state, and will also furnish a few copies to all the baggage masters of your lines.

These regulations go into effect January 1, 1900.

We trust that we shall receive your official co-operation in carrying out the provisions of these regulations.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

The following letters are herewith inserted for the purpose of showing the hearty co-operation of the railroads in enforcing the rules:

FITCHBURG RAILROAD COMPANY,

OFFICE OF THE GENERAL BAGGAGE AGENT,

BOSTON, Mass., December 8, 1899.

Irving A. Watson, M. D., Secretary State Board of Health, Concord, N. H.:

DEAR SIR,—I hereby acknowledge receipt of your letter of November 8, inclosing rules and regulations regarding the transportation of the dead in the state of New Hampshire.

Beg to advise that I referred the matter to our general passenger agent, who advised that he considers the matter a good thing, and we will stand by you in placing the rules in effect on this line, commencing January 1, 1900.

Kindly send me twenty-five copies of the different circulars, so that I may place one in the hands of our representative agents in the state of New Hampshire.

Yours truly,

(Signed) G. E. BYNAM,
General Baggage Agent.

BOSTON & MAINE RAILROAD,

GENERAL BAGGAGE DEPARTMENT,

BOSTON, Mass., December 7, 1899.

Mr. Irving A. Watson, Secretary State Board of Health, Concord, N. H.:

DEAR SIR,—Yours of the 8th ult., with inclosures in reference to rules and regulations adopted by your board regarding transportation of the dead, was duly received, and if you will forward to me four hundred copies of each kind of transit permit, I shall be pleased to furnish our agents with sample copies, together with such instructions as may be necessary to see that your rules and regulations are complied with.

Yours truly,

(Signed) C. J. WIGGIN,
General Baggage Agent.

GRAND TRUNK RAILWAY SYSTEM,

OFFICE OF GENERAL MANAGER,

MONTREAL, P. Q., November 27, 1899.

Irving A. Watson, Esq., M. D., Secretary State Board of Health, Concord, N. H.:

DEAR SIR,—Replying to your favor of the 9th inst., in reference to the law recently adopted by the state of New Hampshire, acting in accordance with the recommendation of the State Board of Health, covering the transportation of the dead, I have had the general baggage agent check over the papers which you inclosed, and place himself in communication with you, with a view to obtaining the necessary forms, instructions, etc., in order that they may be placed in the hands of our agents throughout the state of New Hampshire.

The general rules and forms, however, which you submit are on a parity with those now in existence on our system, with the exception of the new feature of licensed embalmers, which will, of course, be observed.

We trust that the various other states through which our lines extend will soon adopt similar laws, when, of course, the rules of this company will be changed so as to conform throughout our entire system.

Yours truly,
CHARLES M. HAYS,
General Manager.

Results.

Notwithstanding the short time in which the law relating to the registration and licensing of embalmers, and the transportation of the dead, has been in force, we can say that it is now in full operation without any friction and giving general satisfaction to transportation companies, to the embalmers themselves, and to the public. No such lax state of affairs exists as heretofore. Bodies are shipped and reach their destination in excellent condition. Bodies dead of diphtheria, scarlet fever, etc., are now shipped to any point.

Not only has this law proved of great benefit in the handling of dead bodies in our own state, but it makes it possible to ship those dead of even contagious diseases to any point desired. Previous to the enactment of these rules it was impossible to ship bodies dead of communicable diseases, and under certain other conditions, from New Hampshire into many of the other states. Now they are received without question. Not only has the law been of general public benefit, but it has placed the embalming profession upon a considerably higher plane, and has resulted in a State Embalmers' Association, organized for the purpose of advancing the science of embalming.

Disinterment of Dead Bodies.

In order to disinter a dead body, it is necessary to obtain a permit from the State Board of Health, and also one from the proper local authorities (the town clerk in towns, and the board of health in cities). Application for disinterment is

made upon a blank furnished by the State Board of Health. The following notice upon the reverse side of the blank gives substantially all the requirements governing the disinterment of dead bodies:

NOTICE.

The penalty for digging up, disinterring, removing, or carrying away any human body without lawful authority, is imprisonment not exceeding one year, or a fine not exceeding two thousand dollars, or both.

A separate application must be made for each body.

A copy of certificate of the attending physician, giving the cause of death, must be sent with the application. If the attending physician has deceased, removed, or is unknown, the facts must be stated in the application.

Where cause of death is certified by a coroner, the application must so state.

No permit will be granted on application made by telegraph or telephone.

Names of persons and places must be written so plainly that no mistakes can be made in the permit.

A body deposited in a receiving tomb may be removed therefrom for interment in any cemetery in the same, or adjacent, town or city upon a permit issued by the proper local authorities (the town clerk in towns, the board of health in cities), provided the removal is by private conveyance.

If a body deposited in a receiving tomb is to be transported other than as above stated, or by public carrier (railroad), a permit must be obtained of the State Board of Health, in accordance with Rule 8 of the "Official Order concerning the Transportation of the Dead."

Bodies dead of scarlet fever, diphtheria, or other dangerous communicable disease, must not be placed in a receiving tomb unless they have been previously prepared by a licensed embalmer in accordance with the requirements of Rule 2 of the "Official Order concerning the Transportation of the Dead."

Bodies that have been buried must not be disinterred except in accordance with a permit issued by the State Board of Health, and also by the proper local authority.

Blank applications for permits will be furnished on request to the State Board of Health.

Undertakers and others will save possible delay and trouble in the removal of corpses, by strictly conforming to these instructions.

THE EXAMINATION OF PLUMBERS, PLUMBING, AND HOUSE DRAINAGE.

At the last session of the legislature these subjects were fully and carefully considered by the committee on public health, of the house, and by the judiciary committee of the senate. At the several hearings it was shown that defective plumbing and the improper construction of house drainage were the sources of much sickness, with not infrequent fatal results.

Health officers of cities who had been engaged in practical sanitary work, in house-to-house inspections, etc., were united in reporting that a great deal of bad and dangerous plumbing existed, owing, chiefly, to improper and unworkmanlike and unscientific methods of construction. So overwhelming was the evidence along these lines, and so evident the need of some reform, the following act was passed by the legislature:

AN ACT AUTHORIZING THE EXAMINATION OF PLUMBERS, AND REGULATING THE PRACTICE OF PLUMBING AND HOUSE DRAINAGE.

(Chapter 55, Laws of 1899.)

SECTION 1. No person, firm, or corporation engaged in or working at the business of plumbing in any city in this state, or in such towns as shall by vote adopt the provisions of this chapter, shall hereafter engage in or work at said business in this state, either as a master or employing plumber, or as a journeyman plumber, unless such person or persons shall first obtain a license or certificate so to do, in accordance with the provisions of this act.

SECT. 2. Any person not engaged in or working at the business of plumbing prior to the passage of this act, and desiring to engage in or work at said business, either as a master or employing plumber or as a journeyman plumber, in any city or town where licenses for plumbers are required, shall be examined as to his qualifications for such business by the board of examiners hereinafter provided for. On or before the first day of September, in the year 1899, every master or employing plumber, and every journeyman plumber, engaged in or working at the business of plumbing in this state prior to the passage of this act, and desiring to engage in or work at said business in any city or town

where licenses for plumbers are required, shall personally register his name and address at the office of the board of examiners hereinafter provided for, and state, after being sworn, where and how long he has been engaged in or has worked at said business, and whether as a master or employing plumber, or as a journeyman plumber. Said board of examiners, if satisfied that the person so registering was actually engaged in or working at said business prior to said date, shall thereupon issue to him a certificate, setting forth that he was engaged in or working at the business of plumbing, either as a master or employing plumber or as a journeyman plumber, as the case may be, prior to the passage of this act, and authorizing him to engage in or work at said business as a master or employing plumber or as a journeyman plumber.

SECT. 3. Every city in this state, and such towns as above provided shall, by ordinance or by-law, within six months from the passage of this act, prescribe rules and regulations for the materials, construction, alteration, and inspection of all plumbing, house-drainage, and sewer connections, creating a board for the examination of plumbers, fixing the length of term each member shall serve, and providing for an inspector of plumbing. Said board shall be appointed by the mayor or board of selectmen, and shall consist of the following three persons: A member of the local board of health, the city or town engineer, or, in the absence of such officer, a local physician in regular practice, and a journeyman plumber of not less than five years' active and continuous practical experience.

SECT. 4. The examining board herein created shall examine and pass upon all applicants, whether as masters or employing plumbers, or journeymen plumbers, in their respective cities or towns, and also all persons who may apply for the office of plumbing inspector. They shall issue a license to such persons only as shall successfully pass the required written and practical examination; and they shall register in a book kept for that purpose the names and places of business of all persons to whom a plumber's license has been granted. They shall not issue a license for more than one year, but the same shall be renewed from year to year upon proper application and upon the payment of a fee of fifty cents. Said examining board shall serve without compensation. Each applicant for examination for a plumber's license or certificate shall pay the sum of one dollar, and all moneys so collected shall be paid into the treasury of the city or town where such application is made. The license or certificate provided for by this act shall be non-transferable; and said application and examination shall not be required of the same

person more than once in the same city or town. Said license or certificate shall be valid throughout the state.

SECT. 5. Any person violating any provision of this act, or any ordinance, by-law, rule, or regulation made thereunder, shall be deemed guilty of a misdemeanor, and shall be subject to a fine not exceeding fifty dollars for each and every violation thereof, and his license may be revoked by the examining board provided for in this act.

SECT. 6. The provisions of this act shall apply to all persons who are now or may be hereafter learning the business of plumbing, when they are sent out to do the work of a journeyman plumber.

SECT. 7. All acts and parts of acts inconsistent with this act are hereby repealed.

SECT. 8. This act shall take effect on its passage.

[Approved March 9, 1899.]

In order that the law might be brought to the attention of local authorities, the following letter was addressed to the mayor of each city in New Hampshire:

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY,

CONCORD, N. H., August 14, 1899.

To the Mayor:

MY DEAR SIR,—If your city has not already acted in the matter, I would respectfully call your attention to chapter 55 of the laws passed at the January session, 1899, entitled "An act authorizing the examination of plumbers, and regulating the practice of plumbing and house drainage."

This law makes it incumbent upon every city in the state to appoint, on or before the ninth day of September next, a board for the examination of plumbers, and to prescribe certain rules and regulations.

Inasmuch as this measure has an important bearing upon the public health interests of every city, we deem it our duty to call your attention to the enactment, and also to suggest that as soon as all the cities of the state shall have complied with the provisions of the law, a joint meeting of the several boards, or of the representatives of such boards, be held for the purpose of formulating regulations which shall be uniform throughout the state, so far as local conditions will admit.

We would suggest that the adoption of an ordinance relative

to rules and regulations be deferred until after the joint meeting of the boards, as above suggested.

We trust that your city government will co-operate heartily in securing the objects of this law, as one of the most direct means of promoting the public health interests of your city.

Kindly report to this board when the appointments are made, with names of appointees.

Very truly yours,
IRVING A. WATSON,
Secretary.

In order to put into execution the foregoing law so that the public might receive the best results, it seemed necessary to hold a conference of the health officers of the several cities, and to agree, if possible, upon some uniform method of procedure, so that the examination of plumbers, the requirements for plumbing materials, and, in fact, all the details to be carried out under the law should be as nearly uniform as possible throughout the state.

With this end in view, at the annual meeting of the New Hampshire Association of Boards of Health, held in the city of Concord, December 19, 1899, the following topics were presented for consideration:

A. A set of rules and regulations relating to plumbing, drainage, and sewerage, applicable to the cities and towns of New Hampshire, as provided for in an act passed at the last session of the legislature.

B. What shall constitute a proper examination of plumbers and how shall uniformity in examinations be secured?

C. General discussions of questions pertaining to plumbing, drainage, sewerage, house inspection, etc.

Topic *A* was presented by Dr. Irving A. Watson, secretary of the State Board of Health. Topic *B* was considered by Mr. William K. Robbins, chairman of the board for the examination of plumbers, Manchester.

In closing the discussion on topic *A*, the secretary of the State Board of Health stated that after careful consideration of the subject he felt that the matter was of too great importance for any individual to present, with the expectation that a set of rules and regulations so prepared would be

aspect of it, and in that direction we would naturally turn for protection to the public against incompetency.

It is well known that unregulated and entirely unobserved or uncontrolled work in this line has resulted continuously in danger to the public health, and danger sometimes from real accident to a person on account of people undertaking to do plumbing when not capable of doing it. The average citizen probably knows less about plumbing, *i. e.*, whether the work is properly done, than any other trade or handicraft that is known. It goes beyond the notice of the ordinary man, and even educated men,—lawyers, doctors, and scientific and professional people,—are often strangely ignorant of what constitutes the proper construction of a drainage system about a house. For this reason it seems necessary to take some measures to protect the public against incompetents in this line of work.

I have considered it the intent of this law which was passed at the last session of the legislature to protect the people from the dangers that are liable to result from inefficiency in installing drainage fixtures in dwellings and other places of habitation. The law was probably not conceived as one that would restrict competition among master plumbers, or that would exclude any person who had served any number of years as an apprentice, nor yet prevent a person from starting in the business who had not been in it, but may possess sufficient knowledge to conduct it properly. Its aim is simply to secure to the public plumbing work done by men skilled in the art.

From this it will be seen that it is not necessary that these boards of examining plumbers go fully into the details of all work usually performed by the plumber. There is a considerable amount of work, such as the lining of tanks and the peculiar manipulation of lead, that really has nothing whatever to do with sanitary matters, and for that reason would be points of minor consideration with such examining boards. It would simply indicate whether or not the party had taken sufficient pains to learn the whole trade in order to become a good workman, but would have but an indirect bearing upon the results obtained from the examination.

acceptable to all the cities of the state. He therefore moved that a committee of five be appointed to formulate a set of rules and regulations relating to plumbing, drainage, and sewerage applicable to the cities and towns of New Hampshire, and also to suggest blank forms of procedure relating to examinations, permits, etc., necessary to the enforcement of the law. The motion was adopted, and the president appointed the following committee:

William K. Robbins, Manchester; William Nelson, C. E., Laconia; D. E. Sullivan, M. D., Concord; E. E. McIntire, Portsmouth; S. S. Dearborn, M. D., Nashua.

TOPIC B: WHAT SHALL CONSTITUTE A PROPER EXAMINATION OF PLUMBERS AND HOW SHALL UNIFORMITY IN EXAMINATIONS BE SECURED?

By William K. Robbins, Clerk of the Board of Health of Manchester.

Regarding the business of plumbing, so large a proportion of it consists in the manipulation of lead that it rightfully and properly derives its name from that. Plumbing is not, however, as the word would seem to imply, strictly confined to that particular work, and should not be so considered. I think it would be satisfactory to consider that occupation as supplying to buildings of whatever description, whether a dwelling-house, store, or factory, the necessary piping, connections, fixtures, etc., for the admission of water, and for the leading away of water, and the products carried by water, from the buildings. This would necessarily involve some work which does not directly concern the public, and such portions of the business as would not be likely to influence the safety of the public in regard to health or danger from bodily injury, it seems, for the purposes of this discussion, need not be taken into serious consideration. For that portion of it which affects the safety of the public, we are mostly concerned with the drainage system, the carrying of the waste products by water from premises of various kinds, or, in other words, the sanitary

It is essential that the board of plumbing examiners should exercise great care in the interpretation of this law. They should see that the examinations are fair; that they are such that any reasonably good plumber can pass them without difficulty, and yet sufficiently difficult that a poor plumber, a jack-at-all-trades, could not pass them, and would be excluded from the business. If this is done the public will support the decision of the boards. Still more important is it that, in case of a person working without a license, the decision withholding the same should be so reasonable as to impress the judges of our courts that we are fair and equitable. Then they will uphold us. The public also will respect justice in this as in other things.

I would propose that the scope of the examination be limited, or very nearly so, to the sanitary aspects of the plumber's trade. Inquiries as to whether or not the plumber fully understood what he had to do and knew how to do it properly, whether he could seam up a sheet of lead inside a tank, bend a pipe in a peculiar fashion,—questions as to such work as that might be left out, for really nobody should have the idea that such an examination would take the place of apprenticeship in any way.

One instance came to our notice of a party having procured examination questions in some way, who read up carefully on the subject, went before a board, was examined and got a certificate when he could not properly do the work required of a plumber. He was not a plumber, and is not.

The board of examiners in Manchester have therefore thought it best to divide the examinations into three parts, a written, an oral, and a practical examination, and have the requirements in each of these divisions graded as nearly as possible in regard to difficulty, so that the result of the three departments may be added together and divided by three and that result constitute the standing of the candidate upon which judgment is passed as to whether he is eligible to a license for plumbing. We could hardly do short of this in order to exclude those self-esteemed, very smart persons, who think they can read up and do it all. Such men might pass a written

examination much better than many plumbers would, therefore a written examination alone would not do. They may be quick-spoken enough to pass an oral examination, hence it seemed necessary to require practical work. We have, therefore, separated the work into the three parts, the written, an oral, and a practical examination.

When you talk about conducting an examination, it seems easy enough, but when you come to the real act it shows a degree of seriousness not appreciated before. It is a much more difficult thing to examine a tradesman than a professional man, a doctor or a lawyer, because they are accustomed to looking over things, to handling a pen, etc., but with a plumber it is entirely different. Some of them are bright enough, have had schooling enough to write fairly well, others write very poorly, but they have had no practice in putting their thoughts down on paper. Therefore, to require of them a difficult examination, or expect them to write out full and plain answers to a great number of questions, is asking what a great many good plumbers would not be able to do, and to settle upon just how much and what should be given was something which seemed very serious to me. My leaning was towards leniency in written examinations, and especially to journeymen plumbers. We consequently arranged that the master plumbers should be examined on questions that the journeyman plumber need not know so very much about. A journeyman plumber is supposed to do his work under the direction of a master plumber, and does not do much figuring. So, in preparing our written examination, we looked over the examinations that had been submitted by a number of other boards, and struck what we thought was a fair average, and selected the number of questions, namely, twenty for the journeyman plumber, and thirty for the master plumber. Then, of course, came the question of what we should ask. We had questions submitted by other boards and used some of them. We did not originate all the questions, and I doubt if any board ever did, and certainly if we did that in our first examination we would not feel that we were getting at an average.

These twenty questions given the journeyman plumber, the

master plumber is also supposed to be asked, but the other ten are exclusively for the master plumber. This gives an opportunity for the journeyman plumber to do less writing. We may find a plumber who cannot write or read English, even though he may know some other language, and yet he may be a very good workman, and therefore if he did good work we should lose in the courts if we undertook to exclude him on account of his written examination.

Then we took into consideration the matter of oral examination. After careful inquiry, and making up the best we could from other boards, we decided to use charts showing plumbing work improperly done and requiring the applicant to point out the defects in the system of plumbing work shown on the drawings, and grading according to the number of defects. If he found them all and explained them, he would be entitled to 100 per cent; and such proportion as he did not find would constitute the amount deducted from 100 per cent, and he was marked down accordingly.

I have brought for your inspection the examinations used by other boards, and I have also brought those we used, which will be distributed among you so that you can have ample opportunity to look them over.

We endeavored in our questions to condense, making the questions of a leading nature, and to ask them in such a way that the answer might be concisely given, so as to give a person not felicitous in his expressions an opportunity to answer the question in a few words, and not require any extensive writing, grammar, or rhetoric.

(Exhibits drawings.) The drawings are drawn to a level and scale, and the candidate is placed in a position to see them, and given a reasonable amount of time to look them over, and was also given a scale with which to measure, because we expect them to be familiar with our rules, and we want them to see whether the work is done according to rules.

On one of the drawings there are twelve mistakes, and sixteen on the other, and we have them lettered in such way that we can readily refer to them when pointed out by the candidate. Any reasonably intelligent person ought to be able to see

the mistakes found on the drawing. In examining four candidates we found the scheme worked very successfully. It seemed reasonable to them, as it did to us.

Now it is very desirable, and that seems to be the object of this discussion here, that the examinations conducted in Manchester and Concord, or any other place in the state, should be about equally difficult, and about the same in character, because the law gives a party passing the examination successfully a license to do work in any place in the state. No city would want the privilege of making all the examinations, and of course if the examinations were easier in one place than another, a person could easily take advantage of it by going to that place for examination, perhaps working there for a short time in order to do so. This would entail more duty on some boards than on others, which would not be desirable. On the other hand, while we conduct our examinations with the greatest degree of fairness possible both to the public and the candidates, it would be a matter of regret if a man had obtained a license in another place where they had made a farce of it. Therefore, the examinations throughout the state should be as nearly uniform as possible.

We do not feel that we find much in the law to help us in our difficulty in conducting examinations, and we are glad to have a conference, and when it comes to examining other candidates we shall be glad to have such suggestions or criticisms as will enable us to make them more fair, if possible, than those we have conducted, and we are ready to meet other boards of examiners half way and try to get at what will be uniformity in examination throughout the state.

The practical work we deemed of great importance, but the time required would be considerable, the expense considerable, and we must limit ourselves to something that would be practical on our part as well as on the part of the candidate to be examined, so we confined ourselves to making wiped joints, etc. That is the chief work in plumbing. We decided on a right joint and a crooked joint as being representative of what the candidate would do, and allowed so many points for each

joint, then scored it and settled upon what we considered the mean between worthless work and the good work.

Three questions arose. How shall they be adjusted? Suppose a man cannot write at all but can wipe a joint; or suppose he cannot wipe a joint but can write, what would be the minimum required, and should it be the same in all cases? We felt that 70 per cent out of 100 would be the least we could afford to allow as to the passing mark on the practical work, either for the master or journeyman plumber. As the master plumber is supposed to know the whys and wherefores, he should be required to get 70 per cent in written examination, and if he fall below that we should feel like withholding a license. But with the journeyman plumber we felt he should have considerable allowance on the written work, and if he did his practical and oral work well, well enough to make up, he might fall as low as 40 per cent in written examination. If he could not get 50 per cent on his oral work, even if he passed the other two well, we would feel that he did not merit a license. The final question is whether or not he shall be issued a license. So we decided that the written, oral, and practical results should be added together, divided by three, and the mean should be 70 per cent or over to entitle the candidate to a license. In the little start we have made that has seemed to us very reasonable, and I think the results were as reasonable as we could expect in starting in.

We have brought with us the written questions and charts by which we conducted our oral examinations, and we have a key to them also. (Mr. Wolf explains the practical work.)

Perhaps it may be worth while to call attention to our Rules of Procedure. It seemed desirable that we have something to go by, because by it we can keep out the individuality, that is, an acquaintance and a stranger may be on the same footing.

When we came to register the plumbers, we had some difficulty from taking their applications and neglecting to take their fee at the same time. It was inconvenient to get it afterwards. If the fee is taken with the application the matter is all settled and leaves no room for controversy later on.

I think we have found to our satisfaction that the expense of conducting the examination is more than the one dollar we are allowed to charge for it, and we shall surely run behind. The law was evidently intended to make the fee cover the expense of examination. The material used in the practical examinations, solder, firepots, calking tools, etc., certainly costs considerably over a dollar. It is doubtful if three dollars would more than cover it, counting the time of the members doing the work as nothing.

This whole discussion is offered in the spirit of inquiry. We would like you to examine the questions we have asked, the drawings, and the practical work, on which some have been marked very high and some rejected, and be perfectly free to ask all the questions you can think of, because we are going to learn as much as any of you will.

COMMITTEE REPORT.

The committee on plumbing rules, appointed at the meeting of the New Hampshire Association of Boards of Health, met at the office of the Board of Health of Manchester, N. H., at 11 A. M., January 4, 1900.

Present: Dr. S. S. Dearborn of Nashua, Mr. A. E. McIntire of Portsmouth, and Mr. W. K. Robbins of Manchester; also City Engineer A. W. Dean of Nashua, member of the Nashua board of examiners of plumbers, and Carl O Seaman, plumbing inspector of Manchester, who gave valuable counsel.

The plumbing regulations of several cities of the state being carefully compared, a substantial agreement in regard to actual requirements was found to exist. There was, however, great divergence in wording and manner of adoption. In some cities the plumbing rules stand almost alone as such, while in most they are a part of the city ordinances, and in several they are of recent adoption. In view of these facts, and the suspicion with which members of the city governments and landlords look upon the subject, it seemed to the committee a long and difficult, if not an impossible, task to secure the adoption of amendments by all the city governments of the state, which

would be necessary in order to make plumbing rules that would be uniform. Indeed, it seems unnecessary in view of these additional facts, viz.: First, each city has its rules published and easily accessible; and, second, the technical requirements as to sanitation are nearly the same in all the cities of the state.

When all these matters had been taken into consideration, the committee were agreed that it would be inexpedient to attempt to secure the adoption by the various cities and towns of any system of plumbing rules which would be uniform. It was, however, deemed feasible to secure uniformity in the requirements for the examination of plumbers, said uniformity being important and desirable, since the law makes every license good in any city or town in the state.

The committee therefore recommend that the Rules of Procedure of the Board of Examiners of Plumbers of Manchester, N. H., be adopted, and followed as nearly as possible, by all the other boards of examiners of plumbers throughout the state.

A copy of these rules of procedure is herewith inclosed.

(Signed) WILLIAM K. ROBBINS,
For the Committee.

RULES OF PROCEDURE,

ADOPTED BY THE BOARD OF EXAMINERS OF PLUMBERS, MANCHESTER, N. H.

ARTICLE I.

SECTION 1. The board shall hold their regular meetings upon the first Friday of each month, at 7.30 o'clock P. M., at their office in the engineer's department, City Hall, Manchester, N. H.

SECT. 2. The officers shall consist of a president and clerk, elected annually at the regular meeting in August.

SECT. 3. The president shall call all meetings, preside, and assume the direction of the board; the clerk shall keep all records. The president may call a meeting of the board at any time by notifying the clerk; the clerk shall then notify the other members of the board. The clerk shall also give notice of the regular meetings.

ARTICLE II.

SECTION 1. Applications for examinations will be received at any regular meeting.

SECT. 2. Application must be made out in full upon application blanks furnished by the board. Each application must be accompanied by the fee of $1.00 (required by law) before being received by the board.

SECT. 3. The examination shall consist of written, oral, and practical exercises of such character as to fairly test the fitness and qualification of the applicant for the trade, business, or calling of plumbing.

ARTICLE III.

SECTION 1. In the practical examination each applicant will be required to make at least three different kinds of wiped joints and calk one joint in cast iron soil-pipe.

SECT. 2. Each wiped joint shall be marked according to the following schedule (the number of points as set forth opposite each item being the maximum, the minimum being 0).

POINTS FOR WIPED JOINTS.

No. 1.	For strength	5
2.	For shape	3
3.	For smoothness inside pipe at joint	3
4.	For solder run in a little	2
5.	For solder run in bad	3
6.	For smoothness outside or cracked joints	4
7.	For straightening and dressing pipe	1
8.	For tempering solder	1
9.	For straight inserting and preparing ends pipe	2
10.	For setting up work	1
	Total	25

If hole is burnt in pipe, Nos. 1, 2, 3, 4, and 5 each marked 0.

Each calked joint shall be marked according to the following schedule (the number of points as set forth opposite each item being the maximum, the minimum being 0).

POINTS FOR CALKED JOINTS.

No. 1.	For rolling oakum, tamping uneven	3
2.	For cracked joints	2
3.	For running joint with one pour	3
4.	For calking when too hot	1

5.	For cutting off surplus lead	1
6.	For calking lead home	2
7.	For oakum slipped inside pipe or lead run in	5
8.	For joint leaks when filled with water . .	5
9.	For joint not full all way round . . .	2
10.	For leak all hacked up	1
	Total	25

The total number of points for all joints shall be added, multiplied by four, and divided by the number of joints made. This result shall be the standing or per cent obtained in the practical examination on the basis of 100 per cent for a perfect examination.

SECT. 3. The written examination shall consist of at least twenty questions for an applicant for a journeyman plumber's license, and at least thirty questions for an applicant for a master plumber's license. The written examination shall be marked 100 per cent for a perfect paper, each question having equal weight.

SECT. 4. The oral examination shall consist of questions asked by the members of the board, and the inspection of such charts pertaining to plumbing systems as the board may submit. The applicant shall be marked 100 per cent for a perfect oral examination.

SECT. 5. The applicant (if for a journeyman plumber's license) shall not fall below 70 per cent in the practical examination, 40 per cent in the written examination, and 50 per cent in the oral examination.

SECT. 6. The applicant (if for a master plumber's license) shall not fall below 70 per cent in the practical examination, 70 per cent in the written examination, and 70 per cent in the oral examination.

SECT. 7. The standing or per cent obtained in the practical, written, and oral examinations shall in all cases be added together and divided by three, this result being credited as the standing obtained by the applicant.

SECT. 8. The standing of each and every applicant shall be at least 70 per cent, otherwise the applicant shall be refused a license and his fee of $1.00 returned to him.

SECT. 9. Falsehood or fraud in the application or examination shall be cause for dismissal of the application and refusal of a license.

SECT. 10. When an applicant fails to pass the requisite examination he shall not be entitled to undergo another examination for a period of one year.

SEC. 11. The names and standing of all persons examined shall be formally entered upon the records of the board.

To the city of Manchester should be given the credit of having had in successful operation plumbing rules and regulations which required all work of this character to be inspected and to be constructed in accordance with the requirements adopted, and to be examined by inspectors. In other words, there was in operation an ordinance and regulations very completely controlling the practice of plumbing in that city; but they did not require the examination and licensing of plumbers.

In the report made by the board of health of that city for the year 1899, concerning the plumbing law, it says:

"During the year a new plumbing law has gone into effect, which requires every plumber, master or journeyman, to register as such before September 1, 1899, and such as did not register, or who came to the city after that date, to be examined and licensed. This city was the first in the state to make full compliance with the state law. The mayor appointed the board of examiners in good season, and on the first of September all plumbers of the city were registered, and the board in readiness to give written, oral, and practical examinations to any who might apply for license and examination.

"A list of all licensed plumbers has been furnished this board for the use of the plumbing inspector, together with the request that any violation of the state plumbing law be reported to the board of examiners of plumbers.

"Besides inspecting the plumbing work in progress in the city, the inspector has made many inspections of old work in public buildings, factories, stores, and private dwellings. His judgment in the matter of establishing or remodeling drainage systems has been frequently sought, and with much benefit to the parties and protection to the public.

"The State Industrial School is a particular instance, and as now remodeled the drainage of that institution is most excellent, and the work was done cheaply and with expedition.

"The inspector reports that there are in use in the city probably 3,000 of the old-fashioned water-closets that are

flushed by direct pressure. The supply pipes to these are small and the valves poor, so they are seldom found to be clean and sanitary, and are usually in a leaking condition, permitting much water to run to waste. Probably 2,000 of these closets are in service without meters, so the waste of water is considerable. A decision by the board of water commissioners to require meters in all cases where direct pressure closets are used would do much toward eradicating these nuisances, and at the same time prove a great saving to the city's supply."

The city of Concord adopted an ordinance which is herewith given in full, and which may be suggestive to some cities in the state which have not completed the preliminary work required by the law:

CITY OF CONCORD.

IN THE YEAR OF OUR LORD ONE THOUSAND NINE HUNDRED.

AN ORDINANCE DEFINING THE RULES AND REGULATIONS FOR THE MATERIALS, CONSTRUCTION, ALTERATION, AND INSPECTION OF ALL PLUMBING, HOUSE DRAINAGE, AND SEWER CONNECTIONS.

Be it ordained by the City Council of the City of Concord, as follows:

SECTION 1. The sanitary officer of the board of health shall, in addition to the duties required of him under the city ordinance relating to public health, be charged with the enforcement of the rules and regulations hereinafter contained, and with the enforcement of all other rules and regulations that may be adopted by the city council in the interest of the public health, and shall perform all other duties of like kind that may be from time to time prescribed by the laws of the state and by the ordinances of the city. Said sanitary officer shall be well versed in matters pertaining to sanitary regulations in testing drainage systems and in making examinations of plumbing work; he shall be of temperate habits and capable of keeping all books and records that shall be required of him, and shall make an annual report to the board of health in accord with section 5, chapter 14, city ordinance, including in said report a record of plumbing work inspected, number of permits granted, and any other data that in his judgment would be of interest to the public.

SECT. 2. For services rendered the sanitary officer shall receive the sum of one thousand dollars per annum, payable monthly.

SECT. 3. Every person who shall carry on the business or do

any work of plumbing in the city of Concord shall register his name and place of business in the office of the board of examiners of plumbers, and notice of any change in the place of business of a registered plumber shall be immediately given to the board. This section shall not apply to employees while working for a registered plumber.

SECT. 4. Every plumber, before doing any work in a building, except the repairing of leaks and the replacing of broken fixtures, such as sinks, marble or slate slabs, earthen or crockery ware, and the opening of obstructed and frozen pipes, and the replacing of leaking traps and their branches, shall file at the office of the board of health, upon blanks for that purpose, a description and sketch of the work to be performed, and no such work shall be commenced without the approval of said board or the sanitary officer.

SECT. 5. The plumbing of every building shall be separately and independently connected with the public sewer, where such sewer is within one hundred feet of said premises, unless permission is given by the board of health or the sanitary officer to connect in some other way. When there is no public sewer the plumbing shall be connected with a private sewer or with a cesspool, of a construction and capacity approved by said sanitary officer.

SECT. 6. The main drain of any building, from a point four feet outside the interior face of the foundation wall to a point inside the cellar, shall be of cast iron of a sufficient size, not less than four inches in diameter, of a weight not less than hereinafter specified. Said main drain shall be carried open up through the roof to a sufficient height, not less than two feet above said roof, and not less than five feet above the top of any window within fifteen feet. Should a water-closet be connected with said main drain, the latter shall not be less than four inches throughout its entire length. If no water-closet is to be connected, the main drain may be reduced inside the cellar wall to not less than two inches in diameter; provided, however, that said main drain is again increased to four inches in diameter before passing through the roof.

SECT. 7. Whenever any drain or ventilating pipe shall be run outside of a building, before going through the roof, all such exposed pipe shall not be less than four inches in diameter. If a second line of pipe is connected with the main drain, said main drain must be increased at the point of such connection to not less than four inches in diameter and continue to the sewer or cesspool undiminished. All pipes which pass through the roof

of any building shall be connected to the roof-flange with a tight joint. Change in direction shall be made with curved pipes, offsets, or bends, and all connections to inclined runs with Y branches. The main drain and all other pipes shall, so far as is practicable, be laid above the floor of the basement or cellar and be exposed to sight. They shall be properly secured by irons to walls or floor timbers, and shall not be exposed to external pressure where they pass through or under any wall.

SECT. 8. That part of the drain which is outside of the building and more than four feet from the foundation wall, shall be of cast iron pipe of the same description as that within the building, with lead joints, or vitrified salt-glazed earthen pipe with cement joints. It shall be laid, where practicable, in a straight line, with a uniform fall not less than one fourth inch per foot. No house drain or private sewer shall pass under another house or within four feet of the wall thereof, except by written permission of the board of health. Every drain shall have a clean-out at base of stack and at point where main drain leaves building when said drain is not in a straight line from base of said stack, and clean-outs of all kinds shall be provided with screw-caps.

SECT. 9. Rain-water leaders shall never be used as soil, waste, or vent pipes, but shall be carried to a point five or more feet outside of the foundation wall before being connected with the main drain, and the main drain shall be enlarged at the point where the rain-water leader enters it. When rain-water leaders are within the house they must be of cast iron pipe with leaded joints, or of copper with soldered joints; when outside of the house and connected with house drain it must, if of sheet metal with slip joints, be trapped beneath the ground or just inside of the wall, the trap being arranged so as to prevent freezing. In every case where a rain-water leader opens near a window or light shaft it must be properly trapped.

SECT. 10. Soil-pipes shall be of cast iron and not less than four inches in diameter. Other waste lines shall be of lead, cast iron, or brass, and of not less than the following sizes, viz.: for wash-basins, bathtubs, laundry-tubs, urinals, and sinks, not less than one and one fourth inches; for slop hoppers, not less than three inches. All fittings used in connection with cast iron pipe shall correspond with it in weight and quality. All cast iron pipe and fittings shall be tar-coated.

SECT. 11. Every building used as a dwelling in which plumbing arrangements are to be placed shall be supplied with a water-closet for every fifteen persons. Each room or stall in which a closet is set shall be well lighted and ventilated, preferably with

a window communicating directly with the outer air. No water-closet shall be set in a cellar or basement without permission of the board of health. Every water-closet or line of water-closets on the same floor shall be constantly supplied with water from a tank or cistern and each closet shall have a flushing pipe of not less than one and one fourth inches in diameter. No pan closet shall be set. No direct supply closet shall be set unless located outside of the building proper in places where tanks cannot be made secure from frosts, and no such location of closets shall be allowed unless the board has become satisfied that it is impracticable to put closets in the building proper. When direct supply closets are allowed they shall receive their water supply directly from the main through fixtures, service pipes, and connections approved by the board of health. In cases where the regulations in regard to water-closets have been fully complied with the construction and maintenance of urinals is optional with the owner of the property excepting that in any special case, when it shall appear necessary either in old or new buildings, the board of health may require such a urinal to be constructed and maintained. When a urinal or urinals are provided, all regulations that shall be in force in regard to water-closets shall apply to such urinal or urinals, except as to limit of the number of persons using said fixtures, and also that said fixtures may be supplied with a flushing pipe connected directly with the water main through fixtures, service pipes, and connections approved by the board of health. No water-closet shall be encased in wood-work.

SECT. 12. The waste pipe of each and every sink, basin, water-closet, and of each set of trays or other fixtures except bathtubs, shall be furnished with a separate trap which shall be placed above the floor of the room in which the fixture stands. The waste pipe of each and all bathtubs shall be furnished with a trap acceptable to the sanitary officer, which shall be placed as near the fixture it serves as is practicable.

SECT. 13. Traps must be protected from siphonage and ventilated by special lines of cast iron vent pipe not less than two inches in diameter, except round traps five inches or more in diameter serving bathtubs and wash-trays, and when the delivery pipe from a trap to a line of pipe running through the roof is four feet or less in length, measure to be taken from the center of the trap to the hub of the fitting on the pipe running through the roof. The short lines from these branches to each trap, if exposed to view, may be of lead or brass. They shall be two inches in diameter for water-closet traps, and of the same size as the waste pipe for other traps. Vent pipes for water-closet traps, when more than thirty feet in length, shall be three inches in diameter.

All vent pipes must extend at least two feet above the roof, or they must connect with the soil-pipe above the highest fixture, and in no case shall they terminate in a chimney-flue. They shall be run as direct as possible. Bow venting will not be allowed unless connected in such manner as to prevent pockets being formed. If less than four inches in diameter they shall be enlarged to that size before passing through the roof.

SECT. 14. Local vents of water-closets or urinals, when provided, must not be connected with any vent pipe, but must be carried into a heated flue provided for the purpose, or into the kitchen chimney. The board of health may require a local vent in any special case.

SECT. 15. All cast iron pipe through which the discharge of any water-closet passes, and all pipe which is buried in the earth inside of any building or runs within four feet of the interior face of a foundation wall of any building, shall be of the description known as the extra heavy pipe. All pipe shall be of uniform thickness, free from all defects, and shall have an average weight per linear foot not less than below specified, viz.:

Internal diameter, 2 inches, ordinary pipe, 3½ pounds; extra heavy, 5½ pounds.

Internal diameter, 3 inches, ordinary pipe, 4½ pounds; extra heavy, 9½ pounds.

Internal diameter, 4 inches, ordinary pipe, 6½ pounds; extra heavy, 13 pounds.

Internal diameter, 5 inches, ordinary pipe, 8 pounds; extra heavy, 17 pounds.

Internal diameter, 6 inches, ordinary pipe, 10 pounds; extra heavy, 20 pounds.

Internal diameter, 8 inches, extra heavy pipe, 33½ pounds.

Internal diameter, 10 inches, extra heavy pipe, 45 pounds.

SECT. 16. All lead pipe used for waste or vent lines shall be of uniform thickness, free from defects, and shall have an average weight per linear foot not less than below specified, viz.:

Internal diameter 1¼-inch pipe, 3 pounds.

Internal diameter 1½-inch pipe, 3 pounds 8 ounces.

Internal diameter 1¾-inch pipe, 5 pounds.

Internal diameter 2-inch pipe, 6 pounds.

SECT. 17. Four-inch lead pipe or bends used in connecting water-closets shall weigh not less than eight pounds to the foot. Weight of lead traps shall be as below specified, viz.:

4-inch round traps, not lighter than 6-pound 4-inch pipe.

5-inch round traps, not lighter than 8-pound 5-inch pipe.

1½-inch traps, not lighter than 3-pound 1½-inch pipe.

1¼-inch traps, not lighter than 2½-pound 1¼-inch pipe.

All sleeves used in connecting lead waste and vent pipe to cast iron pipe shall be of the kind known to the trade as "extra heavy" brass.

SECT. 18. Joints in cast iron pipes shall be packed with oakum run with molten lead, thoroughly calked and made tight. No joint shall be covered with paint until after the inspection and approval required by these regulations. Joints in lead pipes shall, when practicable, be of wiped solder. Connections of lead to cast iron pipes shall be made with brass ferules calked to the iron and connected to the lead by wiped solder, or some equivalent device satisfactory to the sanitary officer. All connections of lead to brass shall be of wiped or overcast solder. Joints in earthen pipes shall be made water-tight by means of the best hydraulic cement with which the joints shall be thoroughly filled, and care must be taken that all mortar which comes through into the inside of the pipe is wiped out.

SECT. 19. Waste pipes from safes, refrigerators, and overflows of tanks or cisterns shall empty over sinks, trapped gully-holes, or otherwise as may be approved, but shall not connect with the drainage system, or be allowed to drip on cellar bottoms.

SECT. 20. No steam exhaust, blow-off from a boiler or heating apparatus, shall connect with a sewer, house drain, or any part of the drainage sytem of the building. Such pipes shall discharge into a suitable tank or condenser, from which a trapped outlet to the house drain may be provided.

SECT. 21. No saddle hub will be allowed on any plumbing.

SECT. 22. The contractor or plumber having charge of the construction, reconstruction, or any portion of the drainage system of any building shall, when the work is completed or sufficiently advanced for inspection, notify, in writing, the sanitary officer, who shall proceed to pass upon the work at once, or not later than twenty-four hours of secular time after such notification.

SECT. 23. No part of any drainage system shall be covered up or hidden from view till approved by the sanitary officer.

SECT. 24. All plumbing shall be tested by water pressure test by the plumber in the presence of the sanitary officer.

SECT. 25. The board shall promptly condemn and order removal of any work not done in accordance with these regulations, and when it finds any piece of work properly done and in full compliance with these regulations, it shall issue its certificate to that effect.

SECT. 26. Bad faith in the performance of work under a permit shall be deemed a sufficient reason for subjecting the plumber so offending to a suspension of his license, and every plumber shall be

held responsible for the violation of these regulations by mechanics, laborers, and helpers employed by him.

SECT. 27. No permit shall be issued to any licensed plumber during the time that he shall fail to agree to remedy any defective work after the sending of a written notice that he has been held responsible therefor under these regulations.

SECT. 28. Under no circumstances whatever shall verbal permission given by any one, whether connected with the government of the city or not, be considered a justification for any deviation from, or violation of, these regulations.

SECT. 29. This ordinance applies only to new work and all modifications, replacements, and extensions of existing work; but shall not debar the sanitary officer from making inspections of any plumbing, and of enforcing section 3, chapter 14, city ordinance relating to public health.

SECT. 30. All ordinances or parts of ordinances inconsistent with this ordinance are hereby repealed.

SECT. 31. This ordinance shall be in force upon its passage.

The efficient health officer of the city of Concord, Mr. Charles E. Palmer, states that the law relating to plumbing, drainage, etc., is being very thoroughly enforced in that city, and with the best of results. He has devised blank forms, consisting of application for a permit to do plumbing, a complete description of the work required, with floor plan, sectional drawings, when job will be ready for final test, etc., the document constituting a complete record of the work, and being filed in the office of the board of health. The results are obvious. Good work is now being done, all of which is examined by a competent inspector without expense to the owner of the buildings.

There can be no question but this entire movement is of great public importance and that it will contribute materially to the sanitary welfare of every city that adopts and carries out in a proper manner the provisions of the law.

Under date of September 26, 1900, we have received from the several cities of the state, in response to an inquiry as to whether the plumbing law had been put into operation, replies which may be summarized as follows:

Cities in which the law is in operation: Manchester, Concord, Portsmouth, Keene, Laconia, Somersworth.

Partially in force: Nashua. (Plumbers registered and licensed. No inspector of plumbing yet appointed.)

Not in force: Dover, Berlin, Franklin, and Rochester.

We have no doubt that the cities which have not yet complied with the regulations will do so at an early day. They cannot fail to realize the importance of this legislative act; besides, the law is mandatory so far as the cities of the state are concerned, and we commend its provisions to the consideration of some of the larger towns of the state.

AN OUTBREAK OF SMALLPOX.

On June 4, 1900, two cases of smallpox were discovered in the city of Manchester. They were promptly taken to the smallpox hospital, and the State Board of Health notified of the outbreak. These were the first cases known to have existed in the state during the past five years, the last outbreak having been reported to the State Board of Health on April 20, 1895.

A prompt and thorough investigation made by the Manchester board of health revealed a history substantially as follows:

It would seem that about the first of April a man and his wife, by the name of Morrin, came from out of town (from Lowell it is believed) and went to No. 75 Orange street, and there engaged rooms on the second floor, boarding with the family below, by the name of Gardellier. On April 2, Dr. Lafontaine was called and found the wife ill with what he now declares to have been chicken-pox, although it is stated that at the time he told one or more persons that it was smallpox. A few days subsequent to this, Mr. Morrin, himself, was taken.

In a few days Mr. Gardellier came down with the disease. The fourth case was Mrs. Gardellier, and the fifth case their child.

The sixth case occurred at No. 443 Dubuque street, on the opposite side of the river, in the family of Leopold Reault.

Mrs. Reault is the daughter of Mrs. Gardellier, and as the families visited back and forth the disease was in this way carried to this section of the city. Four cases appeared in this family. On the first floor in the same building was a family by the name of Lafrancois, in which the disease next appeared, in a boy about twenty-one.

The next appearance of the disease was at No. 60 Orange street, where a child died on May 6 of what is now believed to have been smallpox. The next case, in the same family, was a boy ten years of age.

None of the foregoing cases had been reported to the board of health, the attending physicians having diagnosed the disease as chicken-pox, and one or two of them strenuously maintained this position after the appearance of subsequent cases which left no doubt in the mind of other physicians as to the true character of the disease. In fact, not until after a somewhat severer type of the disease was reached, and a photograph made in one instance, which in itself carried conviction beyond all controversy, was this question fully settled in the minds of the profession and the public.

On June 7 two cases were discovered at No. 12 Bridge street, in the persons of young men, both of whom had nearly recovered from the malady. It will therefore be seen that in this outbreak there had been many exposures.

The board of health, through its efficient inspectors, was exceedingly active in tracing the exposures, and in making daily inspections of the occupants of the houses where the cases occurred. The outbreak was completely suppressed, and the smallpox hospital closed in August. There was a total of twenty-seven cases, thirteen of which were treated at the smallpox hospital. Of those not treated at the hospital, the distribution was as follows: Three on Dubuque street, six at three different points on Orange street, two on Hollis street, two on Bridge street, and one on Rimmon street.

The board of health is of the opinion that two children died of this disease prior to the recognition of the true character of the outbreak.

SMALLPOX—ONE OF THE MANCHESTER CASES.

(Reproduced from a photograph.)

The reason why the disease did not spread to any greater extent may be stated as follows:

First. Owing to the fact that a great majority of the people who came in contact with the infected locality were protected by vaccination.

Second. Owing to the mild type of the disease. The observations and experiences of this outbreak are similar to those in several sections of the United States and Canada during the past year. Almost everywhere throughout North America the disease has been of a very mild type, so much so that it has been classified as "modified, natural smallpox."

Third. Owing to the prompt and most efficient action of the local board of health in removing to the hospital all cases after the disease was identified, and in causing all exposed persons to be vaccinated, and the infected houses thoroughly disinfected.

Smallpox is a disease that alarms to a greater or less degree every community in which it appears, and sometimes the fear is so great as to extend to a considerable distance from the infected locality. Moreover, when this disease appears in a manufacturing center, unless a most thorough watchfulness is exercised over the situation, exposed persons will sometimes suddenly leave town, for fear that they may come down with the disease and be quarantined, or that they may be quarantined as suspects for a certain period. Such a course endangers other localities.

In order that our own manufacturing centers might be on the lookout for such cases, the following circular was sent to the health officers of all the cities and the larger towns in the state:

THE STATE OF NEW HAMPSHIRE.

STATE BOARD OF HEALTH,

SECRETARY'S OFFICE,

CONCORD, June 6, 1900.

Board of Health:

GENTLEMEN,—We hereby officially notify you of the existence of smallpox in the city of Manchester. There are this

morning three cases of the disease in the smallpox hospital, with one reported case, the diagnosis of which has not been verified at this writing by the board of health, but will be within an hour or two. These are all the cases known to exist at the present time.

From a most careful investigation it is believed that the disease has existed in the city of Manchester for at least two months, and that something like a dozen cases have already been discovered which were considered at the time to be chicken-pox, and which are now believed to have been smallpox or varioloid.

The number of exposures has been large. It is estimated that from one hundred to two hundred persons have been directly exposed, and perhaps even more, as on these earlier unrecognized cases no quarantine was placed. One of the cases discovered yesterday, and removed to the hospital, had been sick with the disease some two weeks. In all instances there were many exposures.

You will therefore see that it is utterly impossible to determine how widespread the infection may be, or how many cases will follow. The disease thus far is of a mild type, as it is generally throughout the United States and Canada at the present time.

I may say that the houses and all the occupants where the cases now in the hospital were found are under strict quarantine, some thirty persons being thus held for observation.

The health department is taking hold of the matter in an earnest and determined manner, and everything possible is apparently being done to restrict the spread of the disease.

We would suggest that your board keep a most careful watch for the disease, for the reason, especially, that, owing to the objection of some of the people to vaccination and the fear of isolation, some are likely to leave Manchester for other manufacturing centers. Indeed, one or two instances of this kind are already known.

Owing to the mild type of the disease everywhere, we would suggest that you ask the physicians of your city to report every case of eruptive disease simulating chicken-pox or smallpox, and to have the diagnosis verified beyond question. It is by no means an easy matter to differentiate between certain types of chicken-pox and certain types of smallpox, and serious mistakes in diagnosis have occurred in several sections of the country, owing to the mild form in which the disease has prevailed.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

Considerable apprehension was felt that if the military companies of Manchester attended the annual encampment in Concord there would be great danger that the command might become infected and that the disease might be carried to different parts of the state. Protests were made against the companies from Manchester attending the encampment, and so strong was the feeling that the governor, through Adjutant-General Ayling, asked for an opinion from the State Board of Health. Upon this subject the following letter was transmitted to the governor:

THE STATE OF NEW HAMPSHIRE.

STATE BOARD OF HEALTH,

SECRETARY'S OFFICE,

CONCORD, June 11, 1900.

Hon. Frank W. Rollins, Governor of New Hampshire:

MY DEAR SIR,—I am informed by the adjutant-general that you desire an opinion in regard to allowing soldiers from Manchester to attend the forthcoming encampment, on account of the prevalence of smallpox in that city.

The situation in regard to this disease is practically as follows:

There are three cases of varioloid and two of mild smallpox in quarantine. It is also very certain that some cases were unrecognized during the infective period and that, as a consequence, there has been considerable exposure.

However, owing to the fact that a very large percentage of the population are probably well vaccinated, and that the disease has appeared in a very mild form, it is quite possible that other cases may not appear, although this is by no means certain.

I am of the opinion that the following course should be taken with reference to the Manchester soldiers:

First. That the different commands should be assembled in their respective armories at once, and carefully examined by the regimental surgeon, and that all persons who have not been vaccinated should be, as well as all those who have not been re-vaccinated within a reasonable time. Any soldier who persistently objects to this course should be discharged from the service.

Second. That while in camp the proper medical officer

should make a daily inspection of each man in the several Manchester companies, with a view to discovering any eruptive disease that might possibly appear.

If the above suggestions are carried out I do not think there will be the slightest danger in allowing the Manchester companies to go into camp.

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

Subsequent events proved that the foregoing view of the situation was correct, inasmuch as not a single case of smallpox was contracted thereby.

Smallpox at Pittsfield.

On Tuesday, August 7, Dr. S. St. Pierre of Manchester discovered smallpox in the Genest family in Pittsfield, and on the following morning telephoned the fact to the State Board of Health.

On the same day, August 7, by direction of the State Board of Health, Dr. George Cook, special inspector of the board, went to Pittsfield to make an investigation. He found the disease to be smallpox. The history of the outbreak is substantially as follows:

The first case is traced back to May 30, when a child in the family of Herbert Wilson was taken sick, the disease being diagnosed as chicken-pox. The next case occurred about two weeks later, in the family of David Genest. There were five cases in all, four of whom had recovered, one nearly recovered, and another case just coming down with the disease at the time of Dr. Cook's visit. The disease was next communicated to the family of David Genest, Jr., in which family there was one case, recovered. One child, by the name of Bishop, a boarder in the last-named family, was ill with the disease at the time of its discovery.

The next case was in the family of Edward Boucher. Two cases contracted from the Boucher family were discovered at David Genest's; also two cases in the family of David Edgerly, contracted from the Boucher case. One case, a girl about a

dozen years old, was found at George Edmunds's, just over the line in Chichester.

On August 9 the secretary of the State Board of Health visited Pittsfield, and in consultation with the local board of health went over the entire situation. Prompt measures were agreed upon and inaugurated to restrict the spread of the disease. At that time there were seven active cases of smallpox in six different families, including the Chichester case.

The course recommended to the local board of health was that they obtain a house suitable for an isolation hospital, to which all cases should be removed; that all exposed persons should be promptly vaccinated; that the infected premises be thoroughly disinfected immediately after the removal of the patients; and that a daily inspection of all the inmates be made by the attending physician until the period of incubation should have passed in all cases.

The next day the local board of health found it to be utterly impossible to obtain a house for an isolation hospital, and therefore they were obliged to allow the patients to remain in the infected houses. To insure a more effctive quarantine, officers were placed in constant charge of the houses.

The experience of a few days proved that it was utterly impossible to maintain an efficient quarantine with two officers to guard the infected premises, and that, without a hospital to which all cases could be removed, there were strong probabilities of an epidemic that might assume considerable proportions. The board of health of Pittsfield therefore purchased an abandoned place consisting of house, L, shed, and stable, with some thirteen acres of land, four and one half miles distant from the village of Pittsfield, for a smallpox hospital, and on August 24 it was opened for the reception of patients, under the immediate supervision of a trained nurse, assisted by a resident of Pittsfield, both of whom had had smallpox. On the same day, August 24, all the cases then existing in Pittsfield, with the exception of one or two who were ready to be disinfected and discharged, were removed to this house.

Following is a record of the cases as returned by the board of health of Pittsfield:

RECORD OF SMALLPOX CASES IN THE TOWN OF PITTSFIELD, A. D. 1900.

August 9. Nine cases and five infected houses reported as follows:

David Genest, Sr. Two cases, one adult and one child. Quarantine established same date and removed September 20.

David Genest, Jr. Three cases, one adult and two children. Quarantine established same date and removed August 22.

Edward Boucher family. One case, child. Quarantine established same date, and removed August 21.

Wilson family. Two cases, children. Quarantine established August 10, and removed August 11.

David Edgerly family. One case, child. Quarantine established August 9, and removed August 21.

Total cases quarantined, 9.

August 23. Isolation hospital established and patients admitted and discharged as follows:

Viola Steele, single, age 20; admitted, August 24; discharged, September 7.

Mary Ducett, single, age 17; admitted, August 24; discharged, September 7.

Philip Ducett, single, age 21; admitted, August 24; discharged, September 24.

Anna Bishop, single, age 11; admitted, August 24; discharged, September 21.

Lester Constantine, single, age 17; admitted, August 24; discharged, October 4.

Florence Bishop, single, age 20 months; admitted, August 25; discharged, August 29.

Victor Drolett, single, age 10; admitted, August 25; discharged, September 22.

David Real, single, age 8; admitted, August 25; discharged, September 17.

Dora Come, single, age 5; admitted, August 25; discharged, September 26.

Phebe Ozier, single, age 18; admitted, August 28; discharged, September 19.

Fred Picard, single, age 18; admitted, August 25; discharged, September 27.

Arthur Real, single, age 7; admitted, September 3; discharged, September 29.

Nelson Pische, single, age 20; admitted, August 29; discharged, September 20.

Mary Bishop, single, age 5; admitted, August 29; discharged, September 26.

Keasy Bishop, single, age 3; admitted, August 29; discharged, September 26.

George Materea, married, age 21; admitted, September 17; discharged, October 6.

Mary Materea, married, age 22; admitted, September 18; discharged, October 6.

George Sawyer, married, age 20; admitted, September 23; discharged, October 16.

Mary Sawyer, married, age 19; admitted, September 24; discharged, October 13.

Total cases admitted to hospital, 19.

It will be seen by the above record that there are known to have been twenty-eight cases of smallpox in Pittsfield, nine of whom were treated at their homes, and nineteen at the hospital. The hospital was opened August 24, and the last case was discharged October 13.

One Case in Chichester.

In connection with the outbreak of smallpox in Pittsfield, it may be noted that one case, found August 8, when investigating the outbreak in Pittsfield, was just over the line in the town of Chichester. The patient was a girl about a dozen years old, in the family of George Edmunds. One of the health officers of that town, Mr. Albert Thompson, was seen by the secretary of the State Board of Health and was directed to placard the house and to maintain an effective quarantine. Strict orders were given in the case. The town board of health employed Dr. F. E. Cummings, who had charge of the

Pittsfield cases, to take complete supervision of the case, which he did, with the result that there were no exposures from this family, and it was the only case that occurred in Chichester.

Smallpox in Danbury.

In accordance with a request by telegraph from Dr. L. V. Knapp, the secretary visited Danbury on October 7, to examine a case of smallpox, and found a young man about sixteen years of age, named Albin M. Evans, ill with modified natural smallpox. The prodromal symptoms were marked, but not severe. The eruption began to appear Thursday afternoon, October 4. The following day the patient visited Dr. L. V. Knapp, who sent him home with some medicine which he gave him for acne. Later in the day, considering the matter more thoughtfully, he had a suspicion that it might be smallpox, and therefore in the afternoon visited the patient, some four or five miles out of the place, and pronounced it to be the latter disease.

It would seem that the boy left home September 22, and went by rail to Franklin, and afterward to Sanbornton, returning in a short time. He states that he remained not more than two or three hours in Franklin. Other than this he had not been away from home.

Dr. Knapp, who had the case in charge, is a member of the board of health in Danbury. Result: Recovery without further spread of the disease.

The Hooksett Case.

On Thursday, October 19, a man who had been employed as a fireman upon the freight train running between Hooksett and Barnstead, visited a physician's office in Manchester to be treated for an eruptive disease, which was immediately recognized as varioloid, and the patient was transferred at once to the smallpox hospital in Manchester.

It seems that four or five days prior, after having been quite ill from the initiatory symptoms, the patient visited a physician, who pronounced the eruption that was then appearing

to be chicken-pox. The man then went back to his engine and made one or two runs over his route, after which he went to Manchester, as stated. The man lived with his wife at Hooksett. Prompt action was taken by the local health authorities to disinfect the premises, and to keep the wife and the trainmen who were associated with him under observation during the incubation period of the disease.

It appears that this man had been at work upon the road only five days after having taken a vacation trip, during which he visited Manchester, Concord, and Deerfield. We have not been able to ascertain where he contracted the disease. The case is a severe type of varioloid, the patient having been vaccinated many years ago. Result: Recovery.

Varioloid at Portsmouth.

On October 16 the State Board of Health received a telegram from Dr. G. E. Pender, chairman of the board of health of Portsmouth, announcing that a case of varioloid existed in that city.

Dr. George Cook, of Concord, whose large experience with smallpox has especially qualified him as a diagnostician in this disease, by direction of this board went to Portsmouth on the day mentioned to investigate the outbreak, and found one case of varioloid. There was no question as to the diagnosis. Its connection with any other case was not established, although possible avenues of infection were traced. The case was well quarantined, and it was not deemed advisable to remove it from the house it occupied.

On November 3, while this report was in the hands of the public printer, the following communication from the chairman of the board of health of Portsmouth was received:

Board of Health,

Portsmouth, N. H., November 3, 1900.

Irving A. Watson, M. D.:

Dear Doctor,—Yours of November 2 received. Have been on the point of writing you for some time, but postponed it for one reason or another.

We have at the present time three houses on Wall street in this city quarantined on account of the presence of varioloid. One of these houses, containing three families, has two cases, and the others one each. Dr. Cook, when here, saw two cases, one of which it was universally agreed was varioloid, and the other turned out to be varicella, although it was quarantined until all signs of the disease had disappeared. This latter child afterward contracted varioloid, and so made both diagnoses pretty positive.

The case of varioloid seen by Dr. Cook is one of four mentioned, and this is the total number. The child who had both varioloid and varicella is one of the two mentioned as being in a house where there are three families quarantined. These cases are in the same immediate neighborhood.

The case seen by Dr. Cook was our only case until last Sunday, when I was called to see the second and third and discovered the fourth. These were in children who had been directly exposed, and were not unexpected. Two of them are so mild that, had they not occurred in this connection, they would probably not have been diagnosed as varioloid.

The entire neighborhood where these cases occurred is under surveillance, and the cases themselves are strictly quarantined, and we have a special officer on duty to see that the rules laid down by us are observed.

I might add that I think it improbable that any more cases will develop.

I thank you for your kind offer of assistance, and will say that I can readily imagine that we might be in position to need it. Will report any further developments.

Very truly yours,

(Signed) G. E. PENDER, M. D.

General Remarks.

The outbreak of smallpox in 1895, which occurred in Sullivan county, chiefly at Claremont, resulted in thirty-eight cases, and followed from mistaking the first case for chicken-pox.

The recent outbreak in this state was due to the same cause, to wit, mistaken diagnosis. The same may be said of nearly every outbreak of any magnitude in the United States during the past two years. These mistakes have been made by reason of the mild form in which the disease has appeared.

So rarely does smallpox appear that it is probable that not

one in ten of the physicians practicing medicine today in New Hampshire, and perhaps throughout the entire country for that matter, ever saw a case of smallpox. Never before in the history of the disease has it appeared in so mild a form over so large an area of country.

In order to call the attention of the profession to this particular point, and to some phases of the present type of the disease, the following circulars were issued:

SMALLPOX AND ITS DIAGNOSIS.

OFFICE STATE BOARD OF HEALTH,

CONCORD, N. H., August 30, 1900.

To Physicians and Health Officers:

Smallpox exists in New Hampshire; so it does in nearly every other state in the Union, as well as in the provinces. It is scattered over the entire continent. In type it is more benignant than ever before known in so widespread prevalence. In this mild form it has continued for about two years, and outbreaks of it have been repeatedly mistaken for chicken-pox. Large areas have been infected by reason of a failure to recognize its character early.

In our own state it is known to have existed in Manchester from April 1 to June 4 before it was reported as smallpox; in Pittsfield, from May 31 to August 7 unrecognized, diagnosed as chicken-pox.

The present epidemic at Hardwick, Vt., and vicinity, started May 25, but was not determined officially to be smallpox until the last of July, two months after it had invaded that town. Similar failures to discover its true character have occurred in other places.

It is not to be wondered at that these errors in diagnosis have occurred. They are due to two causes: First, the wholly unusual type of the disease; second, the inexperience of our physicians, a great many of whom in actual practice today have never seen a case of smallpox. The physician who consults his text-books as an aid to diagnosis finds the disease described in detail as it has ordinarily appeared in the past, and not finding the symptoms in his particular case or cases to correspond with those given,—an absence of the secondary fever, the eruptive condition apparently aborted in the vesicular stage, with a lack of typical pustules, etc., etc.,—he concludes that the disease must be chicken-pox.

A few authors in subordinate notes describe the conditions which are now general, instead of special or exceptional. The following extracts are given:

VARIOLA BENIGNA.

"Van Sweiten and others have described a form of natural smallpox under the title of *Variola Verrucosa,* or *cornea,* stone-pock, horn-pock, and wort-pock, which we sometimes see in these days, and in which the disease is of a mild, modified character. It is ushered in with symptoms as severe as in the dangerous confluent form, but on the third or fourth day of eruption all the severe symptoms begin to subside; the eruption assumes a modified form, such as we constantly see in post-vaccinal cases. We have often had an opportunity of observing this form of the disease in children whose mothers were at the hospital with them, and who knew perfectly well no attempt had been made at vaccination. The pustules are of unequal size, some shrivelling and dying off, while others are maturing. There is no secondary fever, and no pitting. These are examples of mild natural smallpox, such as have occurred, no doubt, at all periods, to a few favored individuals, and in which, fortunately for the objects attacked, the disease leaves no trace behind."—*Reynolds's System of Medicine, Vol. I, Page 132.*

MODIFIED SMALLPOX.

"A large proportion of the cases that occur nowadays in a well vaccinated community are of the modified form. In many instances, so completely is the course of the eruption altered and the symptoms, after the initial stage is over, are so modified that it is often difficult to recognize the identity of the ordinary and the modified diseases.

"In modified smallpox, as a rule, the whole of the eruption is out within twelve hours of the appearance of the first papule. In ordinary cases it is not abundant, and may be macular at first or from the very beginning papular. In either case much of the eruption is usually vesicular within twelve or twenty-four hours, and the vesicles attain their full growth in about three days, while some of the papules abort without becoming vesicles. In size they are usually smaller than those of the natural smallpox, less regularly circular, more conical, and very often not depressed in the center, although many show a faint line of redness from the beginning. In the third or fourth days of

eruption the vesicles are opaque, the lymph is cloudy, and in many patients they do not become pustules, but desiccate unruptured, the inspissated lymph forming small, brown, flat and slightly raised prominences about the size of a small sago grain or less under the epidermis. If they do become pustules they attain the stage of full pustulation within five or six days of the appearance of the eruption, and thereafter desiccate, ruptured or unruptured, as the case may be. The crust or desiccated pustule falls off in the course of a week or less, exposing a flat, reddened, healed surface or epidermis, where usually a little desquamation follows.

"Within a few hours of the appearance of the eruption the symptoms of the initial stage vanish, and the temperature falls to normal; in some cases it may rise again a degree or two, but in many it remains normal throughout the subsequent course of the disease; the constitutional symptoms are accordingly of the mildest description. There is a little restlessness, and the mind may, in severe cases, be confused, but delirium is usually absent, and thirst, if present, is moderate. The intense irritation, amounting in many cases to torture, often to be noted in those suffering from confluent attacks of natural smallpox, is completely absent. The appetite is good, and the patient complains of little but the discomfort arising from the vesicles and pustules, which may render the skin tender to touch and pressure. In a week or a little more, often less, the patient is well; and by the end of a fortnight or less from the beginning of his illness he is up and about. Dermatitis, salivation, and fœtor are absent. There is little if any swelling of the skin of the extremities; but not infrequently, if the eruption be fairly abundant, the face, especially the nose and eyelids, is swelled, and the lids œdematous; in most cases the features are quite recognizable throughout the disease. No complications of importance arise, unless it be a few boils, or an occasional attack of facial erysipelas, slight conjunctivitis, or an occasional corneal ulcer. The appetite is good, and patients take nourishment well from the time that the eruption appears on the skin. Recovery is rapid and complete, and patients can with difficulty be restrained from going into public before they are free from infection.

"These are the symptoms and course of modified smallpox; but it is well to remember that many cases are much milder than is indicated in the above description, while some may be more severe, though death rarely results. If it do occur, it is usually due to accident or intercurrent disease."—*Allbutt's System of Medicine, 1897.*

"We notice a far greater variation in regard to the intensity of the initial stage than in its duration. We find this stage manifested in all possible grades and under the most varying forms, from slight and often wholly overlooked disturbances up to the severest picture of the disease, attended with extremely violent fever."—*Ziemssen, Vol. II, Page 343.*

Concerning the present type of the disease, Dr. John Coventry, medical health officer for Windsor, Ontario, says:

"1. Some have but little prodromal fever; some have pains in back, some do not; some vomit, some do not.

"2. In some the eruption without shotty feeling appeared altogether and disappeared with one crop; in others there is the shotty feeling with the succession of crops.

"3. All the secondary eruptions are papular in the first stage (there being seldom any primary rash) and become vesicles within two days; some have aborted at this stage and dried up, while others become semi-purulent, marked at the apex with a dark spot, but with no umbilication.

"4. In no case has there been secondary fever.

"5. Adults have had a more severe eruption than children, the vesicle in the latter blackening and drying up at the vesicular stage, the crust falling off at the seventh or tenth day from beginning of eruption.

"6. Some have eruption on the fauces, and some have not.

"7. None of the cases seen by him had been vaccinated; while vaccinated persons living in contact with it do not contract the disease, and children vaccinated in time in houses where it is have escaped it."

William M. Welch, M. D., of Philadelphia, in reporting to the State Board of Health, after a careful investigation of an outbreak of smallpox in that state, says:

"It is exceedingly mild in character—so mild, indeed, that many of the more usual symptoms are either absent or so indistinctly marked as to be overlooked. Wherever smallpox has recently prevailed in this country it has uniformly been of the same unusually mild type. It seems scarcely possible that a disease as fatal as smallpox ordinarily is can continue very long without assuming its characteristic severity. Possibly a change of type may be seen on the approach of cold weather. It is, however, of vital importance that the true nature of this malady should be recognized, and that every effort possible should be

made to stamp it out before winter sets in, or before a change of type occurs."

S. E. Darling, M. D., health officer of Hardwick, Vt., in a letter under date of July 23, 1900, to the board of health of Manchester, says:

"The history of the disease here (Hardwick) is as follows: Patients are taken with a severe chill, slight chills following for twenty-four or thirty-six hours; temperature 103 to 105 degrees; severe lumbar pains; nausea and sometimes vomiting; fever continues until the fourth day, when the eruption comes out and fever declines to nearly normal. The eruption is first macular, then papular, vesicular, and pustular, as in smallpox, and usually appears on the face, continuing eight or ten days before desiccation begins. After the eruption comes out, the patient feels able to be up and out. In some cases there is no umbilication of the vesicles; there has been umbilication in one or two cases. The duration of the disease is from eighteen to twenty days. The patient recovers with scars, but rarely any pitting. . . . . We have no cases of the disease in those recently vaccinated successfully."

The extract from Dr. Darling's letter very accurately describes the cases that have appeared in New Hampshire, with the exception that in some instances the prodromal symptoms have not been so severe as those described by him. In our own cases, with one or two exceptions, there has been no secondary fever.

It is not an easy matter, in the prevailing type of the disease, to differentiate it from chicken-pox, especially an isolated case. It should be remembered that chicken-pox is a disease of childhood; that a case in an adult is exceedingly rare; that many observers who have devoted years of practice to the eruptive diseases have never seen a case of varicella in an adult.

"Modified smallpox constantly resembles chicken-pox in (1) the mildness of the symptoms, premonitory and concomitant; (2) the scarcity of the eruption, and its character of coming out in successive crops; (3) the shortness of the duration of the disease.

"Two or three days' high fever, with vomiting, headache, and light-headedness before the eruption, would exclude chicken-pox. The absence of those symptoms would not exclude smallpox."—*Reynolds's System of Medicine, Vol. I, Page 126.*

Owing, therefore, to the conditions which have been alluded to, we would respectfully ask every physician to be unusually careful and painstaking in making a diagnosis in any of the eruptive diseases in any respect simulating smallpox.

We also urge the importance of general vaccination throughout the state, as the only known means of preventing this disease. We especially urge that the law relating to the vaccination of school children shall be rigidly enforced in every town and city in the state.

It should be borne in mind that smallpox is a disease that prevails more mildly, is not so readily spread, and is more easily handled during the summer months than in any other season of the year. There is a fear that with the advent of winter the disease may be intensified, with most serious results to infected communities. It is therefore important that every possible measure be taken to prevent such an occurrence.

Very respectfully,
IRVING A. WATSON,
Secretary.

CHICKEN-POX NOT A DISEASE OF ADULT LIFE.

OFFICE STATE BOARD OF HEALTH,

CONCORD, N. H., August 30, 1900.

To Physicians and Health Officers:

Many physicians conversant with smallpox only through the text-book description of a typical form alone have not infrequently mistaken the present modified variety for chicken-pox. The fact that the latter is a disease of childhood seems to have been overlooked in some instances. True, it is admitted that an adult may have chicken-pox, but so rarely that it might well be a subject for comment.

An epidemic eruptive disease, attacking children and adults alike, cannot be chicken-pox. In support of this position we present some opinions from unquestioned authorities:

"Varicella is essentially a disease of early life, occurring almost exclusively in infants and young children."—*Pepper's System of Medicine.*

"Chicken-pox is a disease of childhood and rarely attacks any above ten years of age."—*Practice of Medicine, Bartholow.*

"Varicella is a disease of childhood and attacks by preference young children and even sucklings. In children over ten years

of age, attacks are infrequent, and I never saw an adult suffering from varicella. Eruptions resembling varicella in adults always indicate variola."—*Ziemssen's Cyclopædia of Medicine.*

"An acute contagious disease of children. It is rarely seen in adults."—*Practice of Medicine, Osler.*

"Varicella is confined exclusively to childhood up to the age of ten, and is rare after twelve."—*American Text-Book of Theory and Practice of Medicine.*

"The variolous disease, whether smallpox or varioloid, often occurs in the adult; varicella, on the other hand, is a disease of infancy and childhood. I have seen one case in adults, but its appearance at this period of life is rare."—*Diseases of Children, J. Lewis Smith.*

"A disease of childhood."—*Reynolds's System of Medicine.*

"An acute specific infectious disease peculiar to infancy and childhood. In children over ten years of age the disease is rare, while in adult life it is so infrequent that many observers of large experience have never met with it. Varicella is particularly a disease of infancy and early childhood. Any varicella-like eruption in an adult should be looked upon with the greatest suspicion and the patients strictly isolated, until, by the history of the case, its source and the course of the disease, all doubt as to the diagnosis is dispelled."—*Keating's Cyclopædia of the Diseases of Children.*

"A disease of childhood."—*American Text-Book of Medicine.*

"Varicella affects children."—*Diseases of Infancy and Children, Holt.*

"In chicken-pox the eruption appears on the first or second day, ... the child remaining but little indisposed. . . . . Neither do the vesicles become pustules unless . . . . or the child is in a condition of debility or suffers from struma. Varicella is separated from variola by . . . . and finally by the fact that it attacks children who have been well vaccinated, whereas smallpox does not."—*Practical Diagnosis, Hare.*

"Chicken-pox is a disease of early childhood. . . . . If, however, smallpox is prevalent in the neighborhood, any case presenting symptoms assumed to be those of chicken-pox should be regarded as suspicious, especially if the patient be an adult."—*Handbook of Hygiene, Wilson.*

"Varicella continues to be a common disease all through the early and middle years of childhood. The susceptibility to the contagion of varicella lessens after ten years of age and almost disappears at puberty."—*Pediatrics: The Hygiene and Medical Treatment of Children, Rotch.*

A circular issued by the Illinois State Board of Health, from which the above references were taken, says: "We desire to emphasize the necessity for the observation of the most stringent precautions in every case of eruptive disease, particularly one resembling chicken-pox or smallpox. The failure of a physician to recognize smallpox readily, or a neglect to recommend the adoption of extraordinary care in all cases of a suspicious nature, may at any time cause the beginning of an outbreak in a community, entailing much sickness and loss of life, panic, interruption of travel, and depression of business, and a financial loss impossible to estimate."

All diseases of a varicella-like eruption in an adult should be looked upon with suspicion at a time when there is a possibility that the disease may be smallpox. Although such a case may not prove to be smallpox, it is not probable that it is chicken-pox.

Very respectfully,

IRVING A. WATSON,

Secretary.

VACCINATION.

CONCORD, N. H., August 30, 1900.

To Boards of Education and Boards of Selectmen:

The legislature of New Hampshire has recognized the fact that vaccination is a preventive of smallpox, and to that end has enacted laws practically making vaccination compulsory with school children, and providing means for general vaccination by towns and cities whenever deemed advisable.

The law makes it obligatory upon school boards to enforce the statutes requiring the vaccination of all children attending school. Section 2, chapter 93, of the Public Statutes, reads:

> No child shall attend any public school unless he has been vaccinated or had the smallpox.

The law is specific in its assertion; there is no mistaking its meaning, and it was evidently designed to be rigidly enforced, judging from its mandatory language.

Section 18, of the same chapter, reads as follows:

> It shall be the duty of the school board to prosecute offenders for violations of the provisions of this chapter. If they neglect to perform this duty they shall forfeit twenty dollars for each

neglect, for the use of the district, to be recovered in the name of the district by the selectmen of the town. All necessary expenses incurred in such proceedings shall be paid by the district.

The Public Statutes, chapter 110, provide for general vaccination, at the expense of the town, whenever such action is deemed advisable by the selectmen. The authority for such action reads as follows:

SECTION 1. The selectmen of a town, whenever in their opinion the health of the inhabitants of the town, by reason of the spreading of the smallpox, shall require it, may appoint an agent for vaccination, who shall be provided at all times with suitable matter for communicating the kine pox. He may vaccinate all persons at the expense of the town who have not had the smallpox or the kine pox, and shall receive a suitable compensation therefor, to be paid by the town.

In some towns vaccination of the poor at public expense has been authorized by local authority. This is wise and proper action to be taken by all towns and cities, whether smallpox is prevailing or not.

We commend the foregoing to the consideration of boards of education and selectmen, and respectfully request that the law be impartially enforced.

Very respectfully,
IRVING A. WATSON,
Secretary.

MALARIA IN NASHUA.

During the summer of 1899 the newspapers announced, in a manner that attracted considerable attention, that an epidemic of malaria was prevailing in the city of Nashua. Some of the accounts purported to be interviews with physicians who were treating such cases, and the impression conveyed was that this disease had assumed epidemic proportions in that city.

In order to get at the facts in the most direct and authentic manner possible, the following letter was addressed to every physician in that city:

THE STATE OF NEW HAMPSHIRE.

STATE BOARD OF HEALTH,

STATE HOUSE,

CONCORD, August 28, 1899.

DEAR DOCTOR,—We desire to obtain as accurate and as complete information as possible relative to the presence of malaria in Nashua and vicinity, and to that end we inclose herewith some questions which we would most respectfully ask you to answer at your first opportunity.

Judging from reports and from other information received by us, it would appear that your city is afflicted with an epidemic of malaria at the present time.

Our investigations will cover the entire southern portion of New Hampshire and contiguous territory, to ascertain, if possible, whether the presence of malaria in Nashua is due purely to local conditions, or if it has invaded your city in the course of an erratic march from some other infected locality, as has more than once characterized previous epidemics in southwestern New England.

Our object is to determine, if possible, the causative factors in this outbreak; whether it is a sporadic epidemic, due solely to local conditions and environments which may be removed or improved, or is dependent upon conditions beyond state or municipal control.

We shall feel under personal obligations to you for any information you may be able to give, not only in answer to the questions alluded to, but in any other direction that in your judgment has any bearing on this disease.

The result of our investigations will eventually be made public, and will be communicated to you through the next annual report of this board, or in some other way.

Thanking you in advance for any aid you may give in this investigation, I am,

Very truly yours,

(Signed) IRVING A. WATSON,
Secretary.

Accompanying the above letter was a blank upon which to return a report, as follows:

REPORT ON MALARIA

BY

Dr. ..... of .....

1. How many cases of malaria are you treating at the present time?
2. How many cases have you treated since January 1, 1899?
3. How many cases during the year 1898?
4. Has there for several years been an occasional case of malaria in your locality?
5. Of what type is the present outbreak?
6. Has a microscopic examination of blood been made to determine the presence of the malaria plasmodium?
7. Are a majority of the cases thoroughly well marked?
8. Have you observed malaria in complication with other diseases? If so, to what extent?
9. Are there any unusual local conditions during the present year that might have a causal relation to this disease? If so, please describe fully.
10. Do you think the mosquito is a factor in the spread of the disease?

GENERAL REMARKS.

(Under this head, please state anything that occurs to you in connection with this disease that has not been included in the above questions and answers. A discussion of the question by you would be gladly received.)

Copies of the above blank, with a letter asking for a report, were also sent to many of the physicians throughout Rockingham, Hillsborough, and Cheshire counties, for the purpose of determining whether or not there was a widespread prevalence of malaria in the southern portion of the state, or if it were confined solely to the city of Nashua.

Following is a tabulated list of the physicians of Nashua who reported, together with the number of patients each was treating at the time (September 1, 1899); the number treated since January 1, 1899; the number treated during the entire year of 1898; and the type of the disease:

PHYSICIANS.	Now being treated.	Treated since January 1, 1899.	Treated during the year 1898.	TYPE OF DISEASE.
Ella Blaylock Atherton	.....	6	.....	Tertian.
I. G. Anthoine	.....	.....	.....	.....
S. G. Dearborn	.....	.....	.....	.....
C. S. Rounsevel	1	1	4	Mild.
James T. Greeley	27	....	4	Tertian.
S. S. Dearborn	.....	5	.....	Tertian.
A. W. Shea	4	60	6	Chills recur every second day.
Auguste Guertin	20	100	25	Intermittent.
R. B. Prescott	1	3	.....	Quotidian.
C. B. Hammond	5	20	40	Mild.
E. D. Robbins	1	4	5	Simple.
H. H. Jewell	.....	1	.....	.....
B. G. Moran	12	54	15	Intermittent and remittent.
P. E Dansereau	50	175	25	Mild.
A. W. Petit	30	1 0	40	Mild every other day.
H. L. Smith	2	3	3	Every other day.
J. N. Woodward	.....	.....	.....	.....
	153	532	167	

The reports made by the above-named physicians were carefully reviewed by the board of health of Nashua, after they had made a careful examination of the existing conditions and had secured from the physicians a report upon the number of cases they were treating. In comparing the two reports the board found that there was a considerable discrepancy in figures. In other words, the board believed that the figures given in some cases were not taken from records kept, and that in some instances the actual number of cases was considerably overstated.

However, the investigation proved conclusively that there were a large number of cases of malaria in the city of Nashua.

Replies from physicians outside of Nashua, in Rockingham, Hillsborough, and Cheshire counties, showed that there was no prevalence of malaria in the field covered by these reports.

Invasions of certain sections of territory by this disease is a matter of history, and these investigations were carried out to determine whether or not the state in general had been invaded by malaria. But a few years ago it made a progressive march from Connecticut, across the state of Massachusetts,

terminating in the southwestern part of Cheshire county in this state. The field covered by its march was carefully mapped out. The investigations referred to, made by this board during the year, showed that nothing of this kind had occurred in connection with this outbreak of malaria in Nashua, and it is, therefore, believed to have been due entirely to local conditions, chief among which may perhaps have been the reduction of the volume of water in Nashua river, by reason of the diversion of a large proportion of its waters by Massachusetts parties for the benefit of the city of Boston.

It is well known that the permanent lowering of a stream of water also lowers the level of the soil water, sometimes for a long distance, thus uncovering and exposing to the action of the air underground strata of soil, thereby setting up different chemical and bacterial action. Such changes have always been regarded as more or less detrimental to public health, for a relatively brief period, at least, following the lowering of the water level. It would seem reasonable that such a change may have been an important factor in causing the outbreak of malaria in Nashua.

The local board of health has divided the city into sanitary districts, and has also been carefully studying this question, but no conclusions, so far as we know, have been reached.

During the present year there has been a great diminution in the number of cases reported, but the city is not yet entirely free from malaria.

REPORT ON STATE HYGIENE.

By Granville P. Conn, M. D., President State Board of Health.

One of the duties of this board, as defined in section 6 of the act to establish a State Board of Health, is: "that the board shall take cognizance of the interests of health and life among the people of the state." . . . . "Shall collect information in respect to these matters as may be useful to the people of the state and report the same through the governor and council."

The broad general principle herewith involved may be construed, that the board shall closely watch the sanitary conditions of all the great financial interests of the state. The importance of this cannot be overestimated, as oftentimes health and prosperity are mutual factors in the great struggle for permanent recognition.

This may be considered as self-evident in every section of our state interested in the transportation or entertaining of summer guests. It matters not whether their visit is one of pleasure or for health, the hygienic conditions surrounding the hotel or other domicile of their choice become of vital importance to both landlord and visitor, and is mutual to both, as on this depend the health and comfort which will induce the one to remain, to the consequent profit of the other.

I believe our transportation companies and the proprietors of our large hotels are all thoroughly imbued with this fact, and are doing all they can to give the patrons of the state those modern improved conditions that constitute the "up-to-date" appointments necessary to satisfy the demands of the public, and, while this is true in the present, it should be impressed upon all concerned, that, in this bustling age of progress, exacting supervision is constantly required; improved appointments

are coming to the front, and the people are demanding more and more for their comfort every year.

The three vital principles of life—pure air, water, and soil—must be supplemented with the assurance that they are in no way liable to become polluted. The fact that all was without fault last year, or even today, may not quite satisfy the patron of next week or next year.

The capital invested in summer property, $10,442,352, the total wages paid to 12,354 employees, amounting to $539,901, and a total volume of summer business and investments for 1899, $6,609,361.71,* represents a golden harvest to the people of New Hampshire, yet depending upon hygienic conditions favorable to health and pleasure, for unless visitors can have reasonable assurance of health and comfort for themselves and their families, the volume of summer travel will at once diminish and more than $10,000,000 of invested capital will cease to be remunerative. If any excuse is needed for making this report I trust this will be sufficient.

Railroads.

It is a pleasure to report that the railroads of New Hampshire are giving more and more attention to the sanitary condition of their stations, yards, and roadbeds, and are endeavoring to make them appear wholesome and healthy. The old, inconvenient, untidy, and unhealthy stations are disappearing, and new stations with modern appointments are taking their place.

At the present time the Boston & Maine Railroad controls the greater part of the mileage of this state, and is giving attention to this subject in an intelligent and appreciative manner.

The Maine Central road, from its first entry into the state, has taken great interest in this matter, and has made it a point that its depots and grounds should be attractive to the public. The depots and grounds along its line are appreciated by the patrons of the road, and serve as object lessons to advertise the line, inasmuch as they present an at-

Vide Special Report by the State Bureau of Labor. 1899.

tractive foreground to the beautiful scenery to be observed in the distance.

The White Mountain division of the Boston & Maine has constructed new depots at East Tilton, Lakeport, Meredith, Lincoln, North Haverhill, and Randolph. They are all models of convenience and good taste, having modern appointments, and can easily be kept clean and attractive. The other stations in the mountain district are in good condition and kept neat and clean. The public and the management are to be congratulated on the fact that since the Boston & Maine has taken charge of the different roads in New Hampshire, marked improvements have taken place in consequence of doing away with joint passenger stations. The sanitary condition of a station depends upon some one person having the power to enforce necessary regulations. At junction stations, where two or more parties are jointly interested in the work, there is very apt to be lax condition of the sanitary appointments. The doing away with these joint stations in consequence of a single management has improved conditions very radically. There are still some stations that are old and should be rebuilt or remodeled. Since 1896, something of this kind has been done annually, and we have no doubt that with prosperous conditions continuing in railway affairs, the old, unsightly, and uncomfortable stations will disappear, or be remodeled so as to be regarded desirable and convenient public waiting places.

On the Concord division, Franklin, Potter Place, West Lebanon, Newport, and Sunapee have comparatively new depots. Others have been remodeled, and new stations have been constructed on the Southern division, while on the same division others have been remodeled.

The State Bureau of Labor estimate that the railroads in the state received from fares $600,000 in 1899.

Hotels.

It may seem superfluous to report upon the sanitary condition of the mountain hotels, yet our climate in the winter months is so rigorous as to cause the best of building material

to deteriorate rapidly, and therefore repairs and renewals are in order early in each season before the visitors arrive. The past year has been no exception to the general rule. The Kearsarge at North Conway was refitted and repaired, and most, if not all, the other houses in that enterprising town were brought up to the standard of excellence. Gray's Inn in Jackson was refitted, remodeled, and enlarged, so that it will now accommodate a larger number of guests than any other hotel in the town. Wentworth Hall, Iron Mountain House, Eagle Mountain House, and the hotel at Jackson Falls were generally refitted and special attention given to the drainage and disposal of garbage. The Crawford was generally repaired, twenty-five new bathrooms added, and its old drains and pipes were replaced with new plumbing. All necessary repairs were made at the Mount Pleasant House and Fabyans, while the Twin Mountain House was remodeled and refitted. At Jefferson, every drain and house pipe in the Waumbek and its cottages was thoroughly tested and much improvement in general sanitation was manifest throughout the town. The hotels at North Woodstock, the Flume, Profile House, and the summer resorts in Bethlehem are managed by those who appreciate the value of applying the principles of hygiene prior to their being occupied by guests, rather than to take any chances of an epidemic of disease by reason of any neglect of proper precautions. The hotels and boarding houses of these towns, as well as those on Sugar hill and Moosilauke mountain, have for a long period enjoyed the confidence of summer guests, and deservedly been popular with the public. The Lancaster House has been entirely refitted, the plumbing renewed, and now has first-class appointments.

Considerable work has been done to the Summit House on Mount Washington during the past year. This house is particularly exposed to the elements, and it is almost impossible to keep it in good condition except by spending large amounts of money annually. The proprietors and the management are well aware of this, and devote a great deal of energy to renewals and refittings, much to the gratification of the public.

The only hotel in the mountains having first-class fire-escapes is the Fabyan. The others are dependent largely upon ladders, and the fact that they are constructed with commodious piazza roof that may be utilized. As all the houses in the mountains are constructed of wood they should have good fire-escapes, and the attendants should be formed into fire companies, being exercised for fire-drill every week under the direction of a chief. This would cause each person to know his station and his work in case of a conflagration. It is true that all of these houses keep night watchmen on duty and exercise every precaution against fire, yet a well organized fire department would prove a popular measure for possible protection.

With the enlargement of hotels it should be a part of the general plan to increase the water supply in the same ratio as is made for the accommodation of guests, otherwise the supply may become entirely inadequate.

Water for fire purposes and for irrigation need not necessarily be such as would be considered good potable water for domestic use. At the present time the most of the larger hotels are supplied with the best of drinking-water brought from natural springs on the side of the mountains in their vicinity.

Good Roads.

The question of securing good roads in the section of our summer resorts is of hygienic importance to the state, because of increased travel occasioned by reason of the increased comfort of journeying with one's own equipage or by public conveyance.

The state has wisely appropriated considerable money annually to repair our mountain roads. This has been made necessary as large tracts of lands are owned by non-residents and are not taxed for highway purposes, consequently in this region there are long sections of road without residential population. Some of these roads are very difficult to keep in repair, because of the want of proper material. It is very necessary that they should be given proper attention, and no

one knows better than the hotel manager the conditions that must be overcome. These men annually expend large amounts in renewals and repairs about their own premises and fully appreciate the financial value of work in this direction, therefore if they would unite in recommending some well organized plan for maintaining good roads through this region their opinions would be entitled to consideration.

The summer guests of the town of Jackson are to be congratulated on the fact that one of their number has caused about two miles of new highway to be constructed to and through a park on the side of Thorn mountain. This park consists of two large farms purchased by the same party, and a drive through this property will give a visitor one of the finest views in the state of the whole Presidential range.

The steam roads parallel long distances of highway that are difficult to keep in repair. By reason of a single line of highway, pleasure travel about some of the mountain houses is confined exclusively to a limited area of observation.

A great many people take comfort and find it conducive to health to spend a large portion of their time while at summer resorts in the open air. Such people have decided convictions that the steam roads, having so many connecting points that might form loops for pleasure travel, will eventually find it to their advantage to equip these lines with the open electric cars, where one can enjoy the beautiful and the picturesque without the annoyance of smoke and cinders.

Public Lands.

Affluent people who have been in the habit of visiting New Hampshire annually for a considerable period have become much attached to their favorite little gems of picturesque landscape. To such people the trail left by the lumbermen, the paper manufacturer, and the usual sequence, devastating conflagration, seem to be an unnecessary intrusion upon their "inalienable rights to life, liberty, and the pursuit of happiness." In several sections of the state our summer visitors have taxed themselves to no inconsiderable extent, and they have purchased some of their choice pieces of landscapes with the money they raised by subscription.

In North Conway the summer visitors have raised between three and four thousand dollars and bought the "White Horse Ledge" and "Cathedral Peak." Not having purchased these properties for the purpose of investment, but really to preserve them intact for the admiration of future generations, they are now looking to the state to accept these monuments of their unselfish and patriotic devotion to the picturesque in New Hampshire, yet they realize the old and homely maxim that what everybody should do no one feels bound to perform, therefore they are looking for the state to arrange for a committee or a commission in behalf of the state to whom generously disposed people can convey by gift, or otherwise, landed property, and at the same time feel assured that it will not again be in the market for speculative purposes. It is well understood by the residents in certain sections of the state that certain lands are considered public by reason of no one paying taxes upon large tracts of real estate. For that reason it is not considered criminal to cut and otherwise destroy the timber growing thereon. It should be a matter of pride to the state that sufficient interest is being taken by our summer guests to purchase parcels of real estate by voluntary subscription, and that in opening these beautiful places to the public it will secure to future generations hygienic centers for all classes to visit.

Now even a state must have some representative to receive and represent its trusts, therefore, I submit that our legislature should in some way legalize the popular idea of the commonwealth's being the curator for the public, and that the state treasurer be the chairman of trustees of public lands. While this need not be a matter involving much money, yet it may eventually allow the state to have a large park system at a minimum of expense.

TUBERCULOSIS.

The public are becoming very much interested in reports from foreign and domestic sources regarding the possibility of obtaining substantial relief from the effects of a disease that for a long period has increased the mortality rate in this and other states more than any other one malady.

There is nothing that more nearly concerns the individual, the corporation, the municipality, the state, and the nation, than health, and consequently it is but natural that the people should be ready to inquire into any means looking to the alleviation of so fatal a disease as tuberculosis.

It is very true that the profession and the people have a far more intelligent appreciation of pulmonary disease than formerly. We realize today that of two persons inheriting the same tendency to this disease, the one living most nearly in the open air will probably live the longer, and enjoy the better health. Our grandfathers in medicine did not realize this. It was the custom, even less than two generations since, to protect such persons from the fresh air, fearing they would take cold. Such patients were coddled in feather beds and imperfectly nourished, but were given plenty of medicine. Today, we consider the cardinal means of the treatment of pulmonary tuberculosis to be: (1) The maximum of pure, fresh, dry air and sunshine; (2) abundance of nourishing food; (3) rest physically, and freedom from nervous care and worry.* It does not matter so much where the patient is being treated, only that these prime requisites to good health, or its restoration, shall ever be present in unlimited quantities.

In a few states money has been appropriated to aid in carrying out these ideas, and philanthropic people have contributed largely from their means to assist those who would otherwise be unable to take advantage of the modern treatment of this disease. Other states have directed committees or commissions to report to the next legislature the expediency of the state becoming a party to this work. The Massachusetts Board of Charity is expected to report to the next legislature on this subject, and all New England may be said to be waiting with great interest to learn the recommendation of so experienced a commission. Discussions and investigations in this line of thought cannot be other than useful, as it will prove educational to the public. The rich and the poor alike will learn that in the treatment of tuberculosis, as in other forms of

*Will Howard Swan, M. D., in the Boston Medical and Surgical Journal, Nov. 1, 1900.

disease, the old is giving way to a new order of reasoning, and ultimately but few will be left in ignorance of the value of pure air, sunlight, good food, and a dry, unpolluted soil, to assist the inherent power of nature in the elimination of all disease.

THE SEPTIC TANK AND BACTERIA BED.

POSSIBILITIES FOR THE ECONOMICAL DISPOSAL OF SEWAGE.

ROBERT FLETCHER, PH. D., DIRECTOR OF THAYER SCHOOL OF CIVIL ENGINEERING, DARTMOUTH COLLEGE, ASSOCIATE AMERICAN SOCIETY CIVIL ENGINEERS, MEMBER OF THE NEW-HAMPSHIRE STATE BOARD OF HEALTH.

1. THE SEPTIC TANK.

"A septic tank may be said to be a large tank covered so as to exclude light and air, wholly or substantially, through which sewage flows in such a way that it has a very regular current and a velocity so slow that the matters in suspension in the sewage rise or fall by reason of differences in specific gravity, and are retained in the tank, there to be decomposed, while the effluent flows out at the farther end of the tank. Devices are used to cause the flow to be distributed over some considerable depth, to prevent surface currents, and to take the effluent from a depth free from suspended matter. Under the conditions of darkness, ill-ventilation, and moderate heat, micro-organisms of the class known as anaërobic bacteria develop in great numbers in the tank. This biological growth and activity produces a chemical decomposition of the retained organic matter of the sewage, a reduction of its compounds into parts, a large portion passing off in the form of gases, a part as inorganic matter with the effluent, and a part as silt-like sludge or ash, which is deposited in the tank. A light floating mat covers the surface of the tank. Both this and the bottom

sludge contain little organic matter. While this action is mainly upon the organic matter held in suspension in the sewage, some reduction in the dissolved organic matter is also effected. The chemical action may be termed a de-nitrifying process, as contrasted with nitrification in sand filtration. The process is continuous and self-regulating, no attendance or labor being required, except for the occasional removal of the sludge." [On this point see beyond; "sludge" in this case is of small consequence. R. F.] "The whole process results in the removal of nearly all of the putrescible organic matter in suspension, and a part of that in solution, producing a clear effluent which may be discharged into small streams without resulting nuisance, and which may be filtered at a far more rapid rate than can crude sewage. It seems also to be true that the compounds are broken down so that after leaving the tank a further purification takes place in the stream much faster than would otherwise be effected."*

Concerning the Exeter (England) tank the well-proved and undisputed facts are as follows: In continuous use since August 16, 1896. Tank 18 feet wide, 64 feet long, 7 to 7¾ feet deep. Designed for 98,000 gallons daily capacity, for a population of 1,500, which provides for the English estimate of 40 gallons per capita daily, and 50 per cent additional. Sewage allowed to stand in the tank nearly twenty-four hours. As to the odor, Mr. Frost, editor of "Engineering News," says:

"There was no smell; a very sensitive individual—like a farmer's wife, who was accustomed all her life to only a reeking barnyard effluvia, for instance—might imagine a small laundry was in operation in the vicinity, but actually the odor from those five filter beds, all more or less saturated with sewage, was not appreciable to my olfactories. . . . I would much prefer to live alongside that sewage-disposal plant than beside a coal yard, a blacksmith shop, a livery stable or rum shop, to say nothing of a cow stable, a pig pen, or even a cheap boarding house, all of which are tolerated in every community, and against the annoyance of which there is no redress."

The net loss of solid matter, on a dry basis, in one year, was

* Prof. A. N. Talbot, University of Illinois.

twenty-six long tons, or 81 per cent of the whole. Mr. Cameron, the engineer who designed the plant, explains this thus: (1) Minute particles of suspended matter pass to the filters but do not clog them; (2) the carbon and hydrogen of the organic matter combine with the oxygen of the same and pass off as carbonic acid gas and water; (3) methane or marsh gas forms and collects in the upper part of the tank, together with free hydrogen (?) and nitrogen.

"The filter plant in which the purification is continued consists of five beds, each of 720 square feet (20 feet by 36 feet) and 5 feet deep. They are water-tight, filled with coke breeze and crushed cinders. One of the beds is always resting for a week at a time. They are operated as follows: By a patented automatic arrangement the effluent from the septic tank is first led into bed No. 1. After this is filled the effluent runs through a small pipe, shuts itself off from bed No. 1, and begins to run on bed No. 2. When this in turn becomes filled, the effluent goes to bed No. 3, and so on around. In each bed the sewage remains about two hours, when the valve in the underdrain is automatically opened and the effluent passes out. Each bed in its turn rests two hours. The operation is continuous and without the assistance of an attendant. During the first rush of the effluent it is very slightly colored, but soon becomes remarkably clear and entirely free from odor."

As to attendance, Mr. Frost testifies: "The automatic machinery by which the filter beds are filled and emptied is on the principle of the flush-tank operated by the tipping bucket; so efficient is this automatic service that the labor or attendance is reduced to less than one hour a day, and that is for occasionally weeding a bed, lighting a lamp daily and extinguishing it, changing the plugs in valve chambers, and to keep the surroundings in a neat and tidy condition generally."

In short, the established characteristics are: Low cost in construction, small cost of maintenance, no sludge to remove, no chemicals used, and no offense to sight or smell. This is the judgment of numerous municipal bodies in England which, after thorough examination and criticism, have already con-

structed or authorized construction of similar plants on a much larger scale.

The Exeter tank is made nearly air-tight by an arched roofing, so that the collected gases may, so far as combustible, be burned at a vent or collected in a gas-holder for use as desired. Moreover, the rate of working is comparatively moderate. Let us now turn to another example, and that more recent and more rapidly operated.

The septic tank at Champaign, Ill., has been in operation two years, and has been carefully studied, after being designed by Prof. A. N. Talbot, widely recognized as a civil engineer of distinction and a man of sound judgment. The following facts concerning it are from his own description*: The tank is 37 feet long, 16 feet wide, and 5 feet deep; capacity about 22,000 gallons, or about one third that at Exeter. And yet it has taken care of a "dry weather" flow of 300,000 gallons per day, the sewage from a population of about 3,500, estimated, including, also, considerable ground water, which works into the sewers along a rather low grade three miles long. When the ground-water level is raised, after rains, the above flow is greatly increased, although all surface drainage is excluded. A slight calculation shows that 300,000 gallons per day fills the tank more than thirteen times in twenty-four hours, or once in less than two hours. On November 22 the flow of sewage was at the rate of 600,000 gallons in twenty-four hours; on February 2, 250,000 gallons; May 3, 400,000 gallons; with temperatures of sewage, respectively, 54°, 47°, and 50° F.; outside temperature on February 2, from 17° to —2°. "The reduction of organic matter in suspension, as shown by the reduction in oxygen consumed, nitrogen as albuminoid ammonia, and total organic nitrogen averages 94 per cent, a very high efficiency. The reduction of organic matter in solution is considerable, averaging 17 per cent. The above are what may be termed cold weather results and it is believed that warm weather results will be even better, since the bacterial activity is then greater. The effluent is seen to be nearly free from organic matter in

*"Engineering News," August 17, 1899, p. 111; editorial, p. 106.

suspension and the amount in solution is not much greater than that in solution in the creek during times of low water."

A considerable quantity of gas escapes when the sludge is stirred; composition: Carbon dioxide (CO_2), 10½ per cent of total volume; free nitrogen (N_2), 28 per cent; marsh gas (CH_4), 55.3; ethane (C_2H_6), 6.2; no trace of sulphurated hydrogen. The large proportion of marsh gas makes the whole quite inflammable; when a lighted match is applied after disturbing the contents a hot flame rises to a height of three feet.

The sludge at the bottom of the tank is a muddy-looking, silt-like deposit, containing about 60 per cent of water, 5 per cent organic matter, and 35 per cent of mineral matter; its fertilizing value is small; the total value of one ton at the market prices of pure fertilizer was found to be 99 cents; it may serve as a filling or top soil. This is the conclusion reached also at Worcester, Mass., where the sludge from chemical precipitation has much more moisture. The amount of sludge at Champaign is relatively small, requiring removal only three or four times a year. For this purpose is provided a small centrifugal pump, operated by a small steam engine. The estimated amount of sludge is about 3 cubic feet, in the dry state, per 1,000,000 gallons of sewage treated; excluding the ground water. This is about one eighth only of average sludge from chemical precipitation. The appearance of the dry sludge and physical condition suggest ordinary prairie loam.

There is no subsequent filtration at Champaign, and the operation is very satisfactory. The effluent has been discharged into the creek with no objectionable results noted in the water below. There is no noticeable odor around the tank outside. Inside the building the gases are very distinct but not specially objectionable. The pumping out of the sludge on a warm day causes a much stronger smell, but even that is but faintly perceptible one hundred feet away.

The development of the septic tank both at Champaign and Urbana, Ill., was entirely independent of that at Exeter, England. In both cases a longitudinal wall divides the tank in two equal parts, so that one part may be cleaned while the other

is in operation. Usually both parts are in use together. Professor Talbot remarks in conclusion:

"The depth of water may advantageously be increased to 6 or 7 feet. The width for ordinary lengths for small plants may not well be more than 12 feet unless great care is used in making the inlet. The length may properly be several times that in this tank. The total capacity should probably equal the flow of the sewage for at least four hours. . . . It is quite doubtful whether the provision for a capacity equal to twenty-four hours' flow is necessary or desirable."

The Exeter tank has a silt basin or "grit-chamber" from which the crude sewage overflows into the tank; this retains any coarse refuse which may come through the sewer. Such an adjunct is lacking at Champaign, but ought to be considered necessary.

Evidently the general method and plan of this system is not patentable. In various countries and for a long time the principles of darkness, ill-ventilation, and submerged outlet, etc., have been in use. Mr. Cameron's patents cover the machinery for automatic regulation and operation. The septic tank itself is a perfected or scientific cesspool, in which the better understood operations of nature are put under control.

The question of covering has been under consideration recently. As before stated, the Exeter tank has a nearly air-tight roof. That at Champaign is covered by a simple shingle roof on brick walls, with doors and windows to admit light for inspection only; usually light is excluded but ordinary atmospheric conditions prevail. At the Massachusetts experiment station of the state board of health at Lawrence, experiments with a septic tank have been conducted by Mr. H. W. Clark, the chemist in charge, beginning with 1898. His conclusions relate to both size, cover, and rate of working, as follows:

"Our studies have also indicated that it is probable that a much smaller septic tank can be used in proportion to the volume of sewage flowing, especially where this volume is large, than has been proposed abroad, for this reason: A sewage of ordinary age, that is, one which has traveled for any consider-

able distance in the sewers, will, when it reaches the point of its disposal, be practically free from dissolved oxygen, all having been exhausted before reaching this point. If such a sewage is run into a properly built septic tank, no air will be carried in with it, and the length of time which it remains within the tank need only be long enough to allow a precipitation of the organic matters in suspension, and the accumulation of the fats upon the surface of the sewage. These matters can remain in the tank for an indefinite time—being added to, of course, each day by the sewage flowing through—and, by the action of the bacteria of decomposition and putrefaction, a large percentage of the sludge will be slowly changed to the soluble form, and pass away to a large extent, perhaps, in the effluent of the tank. It seems to be doubtful if it is necessary to have this tank air-tight; it is also doubtful if it is necessary to exclude light, experiments made at Lawrence seeming to show that the action goes on as well in the presence of air over the surface of the sewage and with light, as it does without air and without light. Of course, with an air-tight tank the gases can be prevented from escaping into the air until just before running upon the sewage filters, and at that time they can be taken care of, and thus prevented, perhaps, from making the tank and its surroundings a nuisance. It is also probable that higher rates of filtration of the tank effluent can be maintained than followed during 1898."

The filtration of the effluent thus referred to was through a "contact filter bed" which is filled with much coarser material than the ordinary intermittent or sand filters. [Examples of the latter are the well-known filter beds at Framingham, Brockton, and Worcester, Mass., and elsewhere; prepared beds of sand, about five feet deep, underdrained, and receiving the sewage intermittently. At Framingham eighteen acres of beds are prepared, and sewage is applied at the rate of 50,000 gallons per acre per day, but this rate might be higher if the beds were not used for raising corn, etc. At Worcester, in October, 1899, one hundred acres of filter beds were being prepared; on twelve acres then in use, 500,000 gallons per acre per day of crude sewage was applied with satisfactory results.] The con-

tact bed has its outlets closed so that the sewage will be in contact with the material at will, instead of escaping by the underdrains as soon as it reaches them. To this experimental bed at Lawrence sewage was applied hourly for eight hours, so as to fill it to the surface. After being full two hours the outlet is opened so that the sewage may drain out very slowly. The material of the filter was five feet of coke, all of which passed a screen with one fourth inch mesh and most of which would be retained by a one eighth inch mesh. "This size of material prevents clogging, gives a larger percentage of voids, and, together with the method of filling, brings all the material into use, air being drawn down to the bottom of the filter daily, and the sewage (that is, effluent from the experimental septic tank) being aërated to some extent as each dose passes rapidly down into the bed." For the last seven months of the year this bed was operated at the rate of 800,000 gallons per acre daily (six days in the week), giving "a better appearing effluent than the intermittent filter, and one which contains less organic matter, as shown by the analyses, and only about one half as many bacteria." The final average comparative rates of filtration of the intermittent and contact filters, reduced to a seven-day basis, were 130,000 and 700,000 gallons per acre per day, or nearly five and one half to one in favor of the contact bed.

2. The Bacteria Bed.

The bacteria bed of English writers is the same in principle as the contact bed just discussed. The use of this has been well developed in England, and there is now available a large amount of data from well-established filters.

At Sutton the tank has an area of 183 square yards. Along the middle of the floor there is a six-inch tile drain with three-inch branch drains running to the side walls; the main pipe has a valve by which it is closed to allow the filling. The material in the tank is broken-up burnt clay 3½ feet deep, excluding all material which would pass a screen of one half inch mesh. Capacity, 13,500 gallons of sewage in voids, which are about one third the volume, while the clay occupies two thirds. The rate

of operation was about 900,000 gallons per acre per day. Before the sewage is applied to the tanks an automatic rotary screen intercepts rags, floating paper, etc. The routine of operation is as follows: Filling three fourths hour, the surface level of sewage being kept a few inches lower than the top of the bed, so as to keep it below the light; the charge remains stationary about two hours, for undisturbed action of the anaërobic bacteria; the valve is opened so that the tank is emptied in about one and one fourth hours; then a rest of two hours for action of aërobic bacteria; hence the total cycle requires six hours. Even after long use the material remains inoffensive. The effluent from this tank is passed through "fine-grained" filters, the grains of the latter not exceeding three eighths of an inch in diameter, being sand, gravel, burnt ballast, or coke breeze. The nitrogenous organic matter was reduced 58.4 per cent in the coarse filter, and about 20.1 per cent in the fine; total, 78½ per cent.

At a recent meeting of the Sanitary Institute in Great Britain Messrs. Dibdin and Thudichum stated the latest conclusions relating to two kinds of beds* in works which have been in service for a number of years. As to the maintenance of water capacity: At Barking Creek a one-acre bed of "pan-breeze" had originally a water capacity of 40 per cent of the whole cubic contents; after three years of constant service this was reduced to 25 per cent. The rate of working, allowing for all rests, was 750,000 gallons per acre per day, with an effluent much worse than that treated either at Sutton or Exeter; this related to a fine-grained bed and the second stage of operation.

The case was found to be different for coarse-grained beds of coke ballast, in which the water capacity showed a constant diminution, falling as low as 15 to 12 per cent and rising slightly after a short rest. But quite a different result ensued with substances having a smoother surface like granite or slate. With beds of such material the effluent was not so good, but the water capacity is greater, and "the inferior quality of coarse bed effluent does not affect its final purification by a fine bed of

* "Engineering Record," October 21, 1899.

coke breeze or cinder. An experimental bed filled with slate constantly yielded an effluent in which the organic impurity in solution was hardly reduced at all, as compared with the original sewage, but the whole of the sludge was removed, and the effluent was readily purified on a fine-grained bed. The water capacity of the slate bed, like that of the granite bed, was high and constant." The reason suggested is that the smooth surfaces permit the more finely subdivided matters to be carried away by the effluent to the fine bed, which is quite capable of dealing with them as well as with the matters in solution. It follows from this that it is not necessary to use such an expensive material as broken coke to do the larger share of work in the primary bed; but that the first treatment may be in a coarse-grain bed of harder and smoother material, such as slate or broken tile, and more work left to be done by the fine-grain beds. The authorities named reported very successful results in the laboratory, with broken glass, in which case the water capacity remained practically unchanged after many months. The proved results were absolute removal of sludge and production of an effluent fit for final purification in a fine bed.

As to size of material most suitable for the coarse bed, some English authorities have advised that the coarse-grain bed be very much finer than heretofore, making it almost a fine bed. To this the authors named object, stating that only coarse materials will allow the suspended matter of the crude sewage to enter into the body of the bed to be dissolved and destroyed. "This result would be entirely frustrated by making the bed of fine-grain material, since the suspended matters would undoubtedly collect on top, and would have to be dealt with separately at frequent intervals, unless the sewage were previously settled to a considerable extent; and in either case the problem of sludge disposal must arise, the very problem which is so effectually solved by the use of a coarse-grained bacteria bed, or by a septic tank." For coarse-grained beds the most suitable practicable size is such as will pass through a two-inch ring and be all rejected by a screen of one half inch mesh; while fine stuff must pass a three eighths or one fourth

inch mesh and be all rejected by a one sixteenth inch mesh, for the fine-grain bed. The latter will admit into its interstices any suspended particles which may be discharged from the coarse bed, and will itself produce an effluent absolutely free from suspended matter.

The experiments at Barking Creek also serve to fix the limit of time of contact of sewage with the bed material at about two hours, which is confirmed by all other experience.

The depth of filter beds has occupied the attention of experimenters in England. In this country, following the example set at Lawrence, five feet has become almost an established standard for sewage purification. A new four-foot bed has successfully treated 550,000 gallons per acre per day, a six-foot bed 832,000, and a thirteen-foot bed 3,500,000 gallons per acre per day. The possibility of so large a reduction of area by increase of depth is an important consideration, especially for works on a large scale.

While it is thus thoroughly proved that a properly made and operated bacteria bed will break up and dispose of animal matter for indefinite periods, there is a danger that such beds may in time be clogged by other kinds of matter. After twelve months' working at Crossness each piece of coke has become partially covered with soft material, which consists mainly of coke with some fine sand, woody and vegetable tissue, cotton and woolen fiber, and diatoms. It has been proved that the original capacity of such clogged beds cannot be restored to any great extent even by prolonged aëration; also that vegetable tissue can be separated from the sewage by a brief period of sedimentation before it is allowed to flow on to the coke bed.

The bacterial efficiency of the coarse beds is found to be very uncertain, so far as sure destruction of dangerous bacilli is concerned. Hence the coarse bed alone cannot be trusted if an effluent is demanded which must be free from germs of disease. It must be noted, however, that this result is owing to the high rate of operation in a tank where the burden of work is put upon anaërobic bacteria. Slow, intermittent filtration under oxidizing conditions has been thoroughly done at

the Massachusetts experiment station through clean gravel stones larger than robins' eggs, and through all grades of gravel and sand to a sand of which the average size of grain was but .004 inch in diameter.

Choice of Method of Sewage Disposal.

It is obvious from this review of the more essential facts and principles, that a small community, seeking an efficient and economical means of disposal and purification, may choose between two or more systems; but usually local conditions and considerations of cost will narrow the possibilities down to either one of two plans, or a combination, or even compel the adoption of a single method. Disposal without purification,—as by discharging crude sewage into streams, or lakes, or upon land for irrigation,—we are not now considering.

1. If a suitable deposit of sand or gravel is conveniently located on cheap land, upon which the sewage may be distributed by gravity, intermittent filtration may be the most satisfactory treatment; supposing that the most immediate requirements are some simple underdraining and a small collecting and settling basin from which the sewage is discharged at proper intervals, and in which coarse material is intercepted. The result is an effluent up to drinking-water standard, as at Framingham, Brockton, Gardner, etc., Massachusetts, Paris, France, and elsewhere. But even in this case the settling basin or collector is a suggestion of, if indeed it does not partly act as, a septic tank. We must remember the considerable drawback to this system, in the item of attendance and labor for changing the distribution from one bed to another, and the occasional scraping or raking of the surface of the beds, maintenance of the surface grades of the beds, etc.

2. Lacking such favorable conditions the septic tank may be most expedient. The construction is simple, and, under proper supervision, cement concrete alone may be used throughout, for base, walls, and roofing or covering arches, at a saving of considerably more than half the cost of brick masonry of the same effectiveness. While we have found good reason to believe that such cover is not required for the efficiency of

bacterial operation, yet in our northern climate exposure to the lowest temperatures of the long winters is so distinctly detrimental, and the obvious advantages of arch and earth covering, to exclude snow and probably prevent all formation of ice on filter beds (and on the septic tank itself, of course, since temperature of sewage is rarely as low as 45° F.), are so great, that the extra expense should be incurred. If complete purification of the effluent is not required the tank alone may suffice, as at Champaign, Ill.; and the final oxidation and reduction may be accomplished in the stream into which it is turned. Its use for subsoil or for broad irrigation is hardly practicable in a northern climate, unless under exceptional conditions.

If complete purification is demanded then small filter beds, like those at Exeter and elsewhere, must be constructed, in which the final process may proceed at a rapid rate, after the modification of the sewage in the tank.

Under the second head we have really, therefore, two distinct cases or alternatives:

a. The tank without filter beds is justified by the experience at Champaign, which caused removal of the very large percentage of suspended organic matter that we have noted, and a considerable reduction in dissolved organic matter. Just on this point further evidence from Lawrence is confirmatory. There, with tank contents stationary for twenty-four hours or more, instead of flowing constantly as in the other case, there was a removal of 48 per cent of albuminoid ammonia and 43 per cent of carbonaceous matter; and, moreover, with a diminution of 85 per cent of the bacteria, those remaining in the effluent being such as could live either with or without the presence of oxygen.

b. In adopting the second alternative under this head, the tank with filter beds, we should consider another result of the Lawrence experiments; that is, that the filled contact or bacteria bed with coke of medium coarse grade (passing one fourth and rejected by one eighth inch mesh) purified the tank effluent more effectively with its larger voids and alternate flow, stagnation and aëration, than did the standard sand filter with its

alternations of continuous flow and aëration without stagnation. Besides this, Mr. Clark found at Lawrence that aëration of the tank effluent before filtration resulted in a better final effluent, and that secured at a more rapid rate. The obvious reason for this is that a condition very favorable for the action of the aërobic bacteria is thus created or imposed. The ideal system, then, would seem to be: first, the tank with a grit chamber as a vestibule; second, aëration of the effluent by breaking or disturbing the current before the stream enters the filters; third, filters of medium coarse coke fragments or crushed cinders, with 40 to 50 per cent of voids.

3. The bacteria bed alone does not commend itself as an economical means to secure the end in view. It involves the tank plus the filtering material, and the expense of procuring and placing the latter is unnecessary if the tank alone would suffice. If such material is coarse enough to reduce the sludge entirely, the bacterial efficiency is almost certainly inadequate. Then if the fine beds must be resorted to for the last stage, we need nothing more than the simple tank for the first.

A comparison between the septic tank and bacteria bed, made by George W. Thudichum, a very high authority in England, is just to the point here. He states in substance:

"In preparing plans for such works there are three governing conditions; the available fall, the nature of the soil, and the possibility of the sewage containing substances injurious to bacteria. Of these, he states that the first two determine which system should be adopted, for if the sewage is delivered at an elevation of less than four feet above the point at which it must be discharged the septic tank possesses an advantage, because no head is lost in the tank and the whole fall can be utilized for the final filtration. If the sewage must be pumped in any case, or is delivered by gravity at a sufficient height to allow the two filtrations of the Sutton system, the adoption of one or the other system is to be decided upon other considerations. The extent of the beds for the final filtration will be the same in either case, and the difference in first cost will be the difference between the expense of a coarse-grain bacteria

bed and that of a septic tank. 'Where the soil is light and porous, so that all tanks and beds must be built of brickwork on concrete bottoms, it is possible that such difference may be extremely small, since the extra cost of covering the septic tank will be compensated by its being of smaller cubic contents than bacteria beds to do the same work, and by its requiring no bed material. Where, however, the nature of the soil is such as to permit of the construction of bacteria beds in the open ground, merely puddling the bottom and sides, the advantage from a pecuniary point of view is entirely with the system adopted at Sutton. On suitable land, such as the heavy clay at Sutton itself, bacteria beds can be made by merely excavating and burning the soil, laying drains on the bottom and returning the burnt ballast; and this has actually been done at a cost, for a bed three feet in depth, of eight cents per square foot, or about $3,530 per acre. In places where the bacteria beds must be erected above the ground level, but where clay is readily obtainable, such beds can be prepared at a relatively small cost; and in these instances, also, the first installation will cost less on the Sutton than on the septic system.' "

Design and Construction of Sewage Works.

This brief review of a very broad field of recent research, experience, and experiment may yet suffice to give to many who are seeking the practical result a general view of the principles upon which success depends. But no large measure of success can be expected unless the design and execution of such works are intrusted to a competent civil engineer. In the modern development of public improvement in the smaller towns and villages throughout the land, a system of water works usually comes first. A system of sewers becomes a necessity not long afterwards. Oftentimes sewers are built piecemeal and in a hap-hazard way, without considering the interests of the community as a whole; then, when the necessity of a comprehensive system is realized, it may be found that the question of disposal was not properly studied at the start. The general practice heretofore has been to discharge the sewage into the most con-

venient gully, stream, lake, or bay, in disregard of the resulting pollution. But this is always a very short-sighted policy. With the growing public appreciation of the necessity of the proper sanitary condition of all the public environment, whether it be in the earth, the air, or the water, comes legislative prohibition of all defilement either by the community or the individual. Then the ill-contrived works may have to be partly rebuilt or remodeled to meet the new question of disposal with purification, which questions would have been duly considered in the beginning if there had been intelligent foresight based upon adequate knowledge. Hence that policy is always the wisest and most economical, in the end, which secures the advice of an experienced engineer, who will consider thoroughly all questions of size of sewers, grades, arrangement, and construction, method of disposal, etc., so as to devise works best adapted to the needs, local conditions, and resources of the town or village. And not only so, but throughout the whole course of construction there must be continuous inspection and supervision in the full interest of the party which pays for the work. However good the plan, only unremitting vigilance can secure successful completion.

It is appropriate to our present purpose to briefly consider, a little more definitely, what is possible as a construction at low cost for a small community. Assume a unit of 1,000 people. For a system on such a scale the English allowance of forty gallons per person per day, domestic use, is ample. The writer has metered purely household consumption, for a year, for all purposes,—including set-bowl, bathroom, kitchen, and laundry, but excluding water consumed by garden hose, which was not metered,—and found a daily average of twenty-five gallons per person per day, with very free use of the water. Considering that any separate system of sewers should have connection with a few roofs, for flushing, and perhaps one or more flush tanks, and that a few small motors, using a moderate amount of water, might be allowed, we consider that if the forty gallons be increased 60 per cent we have ample margin for ordinary emergencies, and thus must provide for a daily flow

of 64,000 gallons for our assumed unit. This is in proportion to the assumption at Exeter for 1,500 people, and there they dealt with some road washings; but American consumption is often from 50 to 100 or more per cent greater than in England. A tank 60 feet long, 20 feet wide, and 7 feet deep would hold 63,000 gallons, that is nearly the probable maximum flow of twenty-four hours. With a longitudinal division wall on the middle line, either half of the tank would pass the flow at double the former rate. If, according to one authority, it is allowable to make the rate four times that at Exeter, our tank would be reduced to about 40 feet long, 16 feet wide, and 6½ feet deep (there must be a wide double inlet, one for each longitudinal half, so as to distribute the flow over the eight feet of width in that compartment); when running full the rate would be twice that at Exeter, or four times with only half in use. Even the latter rate is less than one third that at Champaign. The smaller tank need not require more than 100 cubic yards of Portland cement concrete for base, walls, arched roof, and accessories. In any place where cement would not have to be hauled far from a railway, and where gravel is not too far away, the cost of such concrete need not exceed $5.75 to $6.00 per cubic yard in place and would be less under favorable conditions, including cost of the timber forms for moulding the material. If a suitable sidehill location were available, only a small amount of excavation would be needed, and the top covering of earth could be quickly placed at small cost.

If filter beds are also required we have to consider the least allowable extent. Mr. Clark judges that a rate of filtration in excess of 800,000 gallons per acre per day would be effective. If we allow 871,000 gallons, that would be about twenty gallons per square foot for a contact bed five feet deep, made of suitable sand, cinder, or broken coke. Then 64,000 gallons would call for 3,200 square feet. But at Exeter, through four beds, each of 720 square feet, 98,000 gallons passed in twenty-four hours, which was a proved effective rate of more than thirty gallons per square foot. On this basis, 2,200 square feet, with 25 per cent added for a reserved bed, would suffice; the total for

filters would then be 2,750 square feet. Adding to this the area required for the tank, we have a grand total of about 3,400 square feet, which, by proper arrangement, may be put in one square or rectangular structure, roofed by groined or cylindrical arches of concrete, covered with earth. Such covering costs more at first than one of wood, but is imperishable and gives better protection in winter. For works to serve a greater or less number than our assumed unit, evidently the dimensions must be in proper proportion to those just derived.

As these notes and deductions are intended to be only suggestive we need not pursue the subject more at length in this connection. The interested reader will find abundant information in more detail by consulting the various articles to which reference is made beyond.

In conclusion, let no one imagine that such a system can be left to run itself. The little attention and labor bestowed in the examples we have cited are indispensable and must be given with absolute system and regularity. Intelligent control is the necessary condition of success. The old-fashioned tight cesspool and the so-called improvements upon it failed in this respect; even the inherent defects of construction and proportions might not have been altogether fatal, had there been some intelligent control of the movement of the fluid and some knowledge as to the proper character and disposal of the effluent.

Recent Literature on Purification of Sewage.

The abbreviation E. N. indicates "Engineering News"; E. R., "Engineering Record."

The septic tank at Exeter, England. Description* after a year's experience, "Engineering News," January 13, 1898. Description* by the editor after personal inspection, October 26, 1899, page 276; also of the Yeovil plant. The designer's account of its working, "Engineering Record," March 25, 1899.

From the latter a few more results of importance should be noted: Maximum flow of sewage found to be 2.3 times the ordinary flow. Quantity treated in one year was 371 times the

*Illustrated: plans and views.

contents of the tank. The solid residuum or ash aggregated about 66 cubic yards in a year, from 1,500 people. This is not really sludge, since it consists chiefly of inert mineral matter (as already noted in the experience at Champaign). There was not the least sign of clogging in the filters, which, after a year's work, were to all appearances as clear as on the day they were started. On making a section through a filter which passed 6,000,000 gallons the material of the filtrant was found to be extraordinarily clean and fresh right up to the surface. The chemical tests of the effluent of the filters also testify to the highest efficiency. The oxidized nitrogen often exceeds one part in 100,000, and tests of nine samples for dissolved oxygen gave an average of 1.15 cubic inches per imperial gallon, which is one part in 240 by volume.

The septic tank and bacteria beds discussed by Rudolph Hering, C. E., in "Engineering Magazine," Vol. XV, page 690, September, 1898.* Works at Exeter, Yeovil, Sutton, etc., in England.

Size of septic tank, and question of cover or no cover, in E. N., August 17, December 7 and December 21, 1899.

Experiments at Lawrence, Mass., experiment station, 1898, septic tank and contact beds, etc., H. W. Clark, in report of Massachusetts Board of Health for 1898; summary in E. N., December 21, 1899, page 395.

Construction and operation of septic tank at Champaign, Ill., by Prof. A. N. Talbot, in E. N., August 17, 1899, page 111.* Septic tank and filter beds at Overbrook, N. J., by James Owen, C. E., in E. R., December 16, 1899.

Experience with bacterial filters or bacteria beds in England, in E. R., October 21, 1899.

Rapid filtration of crude sewage through coke, with high efficiency, at London, England, in E. N., November 9, 1899.

Sewage tank or reservoir, of concrete, with covering of elliptical groined arches, at Concord, Mass. Circular, 60 feet in diameter, 22 feet deep, arches 15½ feet, center to center of piers. E. R., August 19, 1899.* Similar reservoir at Clinton,

*Illustrated: plans and views.

Mass., 100 feet in diameter, 13 feet deep. E. R., January 14, 1899.*

The latest experiments at Crossness, England, showing that bacteria beds may be 15 feet deep and do good work with coke fragments as large as walnuts, in E. R., October 28, 1899. Here also it was found that fish would die at once in the effluent from the chemical precipitation treatment,—probably from lack of oxygen,—but that gold fish and others would thrive in the effluent from the bacterial filters.

The bacterial purification of sewage,—lectures by Dr. Samuel Rideal, in E. R., July 22 and 29, August 5 and 12, 1899. These explain the development of the present beliefs concerning the part played by bacteria in sewage purification, various methods of utilizing such agencies in purifying sewage, the chemical and bacterial theories which best accord with experimental results, the probable causes of the comparative failure of some early methods of sewage treatment, and the successive chemical changes caused by different classes of bacteria in the natural methods of sewage purification.

Bacteria beds and the septic tank, their relative advantages, special fields of usefulness and efficacy. George W. Thudichum, in E. R., December 31, 1898.

Reference may be made to an official document printed by Henry Blacklock & Co., Manchester, Eng.: Experts' Report on Treatment of the Sewage of Manchester, Eng.

The chairman was Baldwin Latham, for a quarter of a century designer of, and consulting engineer for, some of the most extensive sewer systems in Europe, and the second member was Percy F. Frankland, probably the most distinguished English bacteriologist.

After an elaborate series of experiments, extending over many months, with experimental plants on a large scale, they unhesitatingly recommend the bacterial treatment for the purification of the sewage of this leading English city, the amount of which, with storm water included, has at times been discharged at a rate exceeding 190,000,000 gallons per day. They judge that not only is this system best adapted

*Illustrated: plans and views.

for the city of Manchester, but their experiments have proved that it is entirely capable of dealing with the large amount of manufacturing refuse which is there produced.

The following references are quite recent and valuable, all of the year 1900:

Manchester Disposal Works, James H. Fuertes, in E. R., June 23 and 30. Gives results of experiments with bacteria beds and septic tanks.*

Septic Sewage Disposal at Liberty, N. Y., in E. R., August 18.*

Bacteria Sewage Disposal during the past year, E. R., August 11.

Septic Tank System of Independence, Mo., in E. R., June 16.*

A small septic and nitrification sewage treatment plant for a club house near Chicago, in E. N., September 7.*

A distributing tank and automatic closing apparatus for Marion, Iowa, in E. N., July 13.*

Experiments with shale and partially septic sewage at Brockton filter beds, in E. N., February 2.*

Sewage and the Bacterial Purification of Sewage, by Samuel Rideal, D. Sc. (Lond.) 1 vol., 8vo., 268 pp., John Wiley, & Sons, New York, October, 1900. $2.00.

* Illustrated: plans and views.

SOME OBSERVATIONS ON THE CAUSES OF DEATH IN NEW HAMPSHIRE.

By the Secretary.

The biennial report, relating to the registration and return of births, marriages, divorces, and deaths, constitutes a volume of between 400 and 500 pages, composed almost entirely of statistical tables, mostly basic in character, and from which the student is able to make accurate deductions upon almost any and every question pertaining to the vital statistics of the state. It is to this report that we would refer any one who desires to study these subjects in an exhaustive manner. But, as a matter of fact, these statistical tables, while of inestimable value for the purpose of making deductions, sanitary and otherwise, are of but little interest to the general reader; hence we give herewith some more easily comprehended observations relating to the chief causes of death.

The total number of deaths for the year 1898 was 6,743, a death rate of 16.68 to each 1,000 of the population, based upon a population of 404,322, as calculated from the census of 1890 and 1900. This death rate was the lowest during the past sixteen years.

In 1899 there were 7,045 deaths, a rate of 17.27 per each 1,000 of the population, based upon a population of 407,938 for that year.

We insert herewith diagrams for the years 1898 and 1899, showing the relative mortality from the twenty most prominent causes of death for the two years named:

DIAGRAM NO. 1.—SHOWING THE COMPARATIVE MORTALITY, BY ABSOLUTE NUMBER OF DECEDENTS FROM TWENTY PROMINENT CAUSES OF DEATH DURING YEAR ENDING DECEMBER 31, 1898.

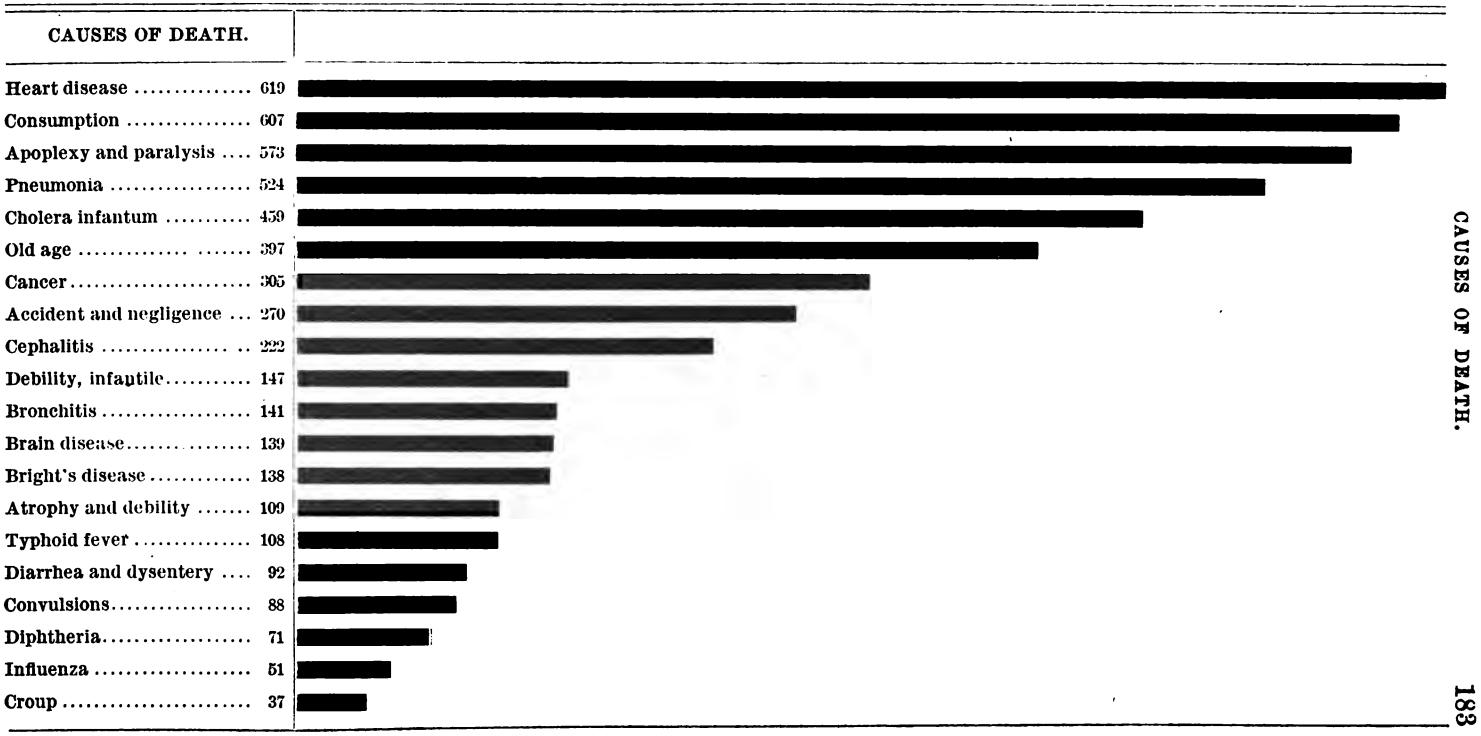
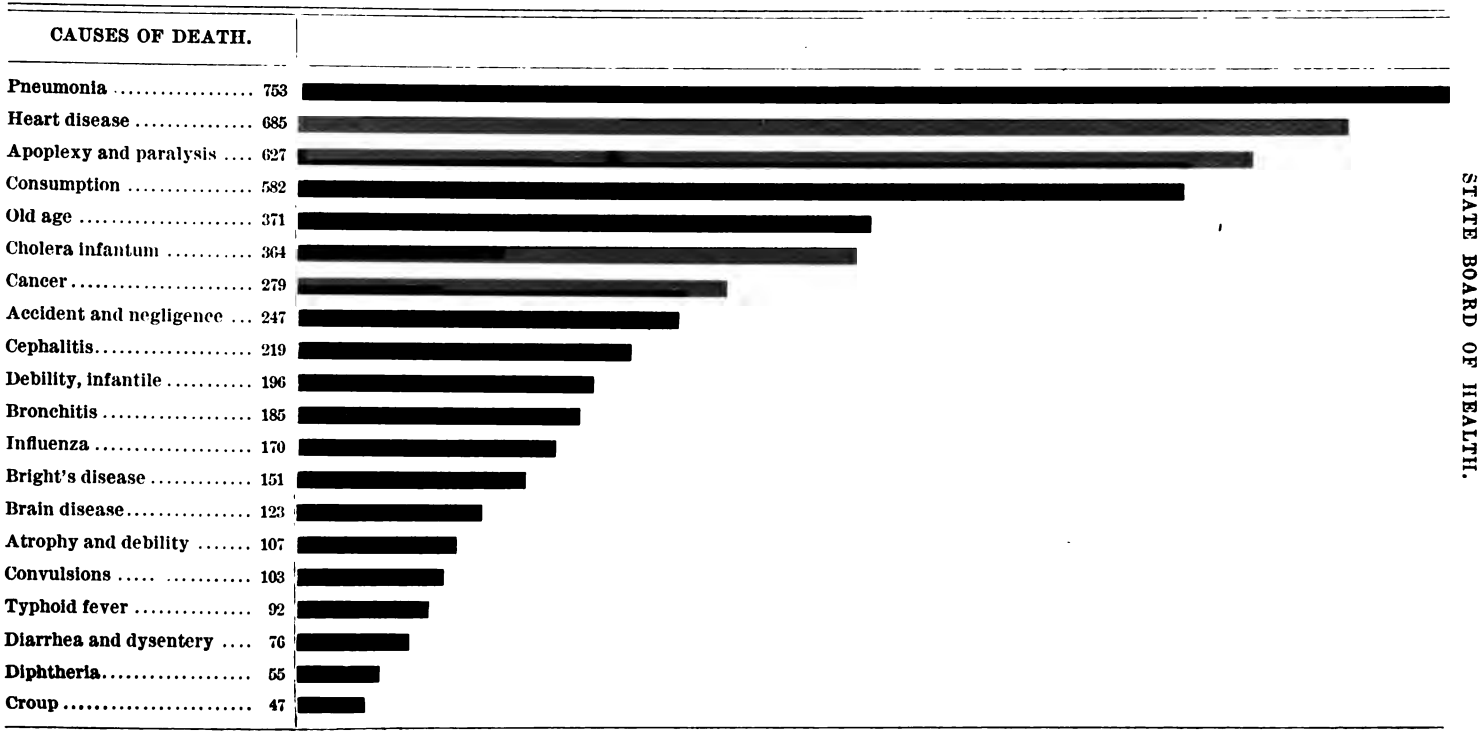


DIAGRAM NO. 2.—SHOWING THE COMPARATIVE MORTALITY, BY ABSOLUTE NUMBER OF DECEDENTS FROM TWENTY PROMINENT CAUSES OF DEATH DURING YEAR ENDING DECEMBER 31, 1899.



In connection with the foregoing diagram, Table No. 1 is of especial interest, as it shows the relative position of these several diseases from 1884 to 1899, inclusive:

TABLE No. 1.

Mortality from Twenty Prominent causes from 1884 to 1899, inclusive.

CAUSES OF DEATH.	Deaths in 1899.	ORDER OF FATALITY.															
		1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.	1886.	1885.	1884.
Consumption	582	4	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1
Pneumonia	753	1	4	2	4	3	3	2	1	2	2	2	2	3	5	2	5
Heart disease	685	2	1	3	2	2	2	3	3	3	3	3	3	2	2	4	2
Apoplexy and paralysis	627	3	3	4	3	4	4	4	4	4	4	4	4	4	3	3	4
Old age	371	5	6	5	6	6	6	6	5	6	5	5	5	5	4	5	3
Cholera infantum	364	6	5	6	5	5	5	5	6	5	6	6	6	6	6	6	6
Cancer	279	7	7	7	7	7	7	8	8	8	7	7	7	7	7	7	7
Diphtheria	55	19	18	18	17	18	19	19	13	13	12	8	15	9	10	18	13
Accident and negligence	247	8	8	8	9	9	9	7	9	7	8	9	8	8	9	8	11
Typhoid fever *	92	17	15	17	13	15	13	13	15	11	13	10	9	10	8	9	10
Cephalitis †	219	9	9	10	8	8	8	9	11	12	11	11	10	12	11	10	12
Diarrhea and dysentery	76	18	16	19	18	17	17	14	17	18	17	12	12	14	13	15	9
Bright's disease	151	13	13	12	14	12	15	11	12	14	16	13	19	15	15	14	14
Bronchitis	185	11	11	9	10	10	10	10	10	10	10	14	11	13	17	12	17
Brain disease	123	14	12	13	11	13	12	12	14	16	14	15	13	11	12	11	8
Atrophy and debility	107	15	14	16	15	19	16	15	19	9	9	16	14	18	14	13	18
Croup	47	20	20	20	19	20	20	20	20	20	20	17	16	16	21	19	22
Debility, infantile	196	10	10	11	12	11	11	17	16	17	15	18	17	23	22	‡	.....
Convulsions	103	16	17	15	16	16	18	18	18	19	19	19	18	21	19	16	15
Influenza	170	12	19	14	20	14	14	16	7	15	18	.....	.....	.....	.....	.....	.....

* Fever, bilious fever, malarial, intermittent, and typho-malarial fevers included. † Meningitis and cerebritis included. ‡ Classed with atrophy and debility.

Consumption.

With three exceptions, and those for the years 1892, 1898, and 1899, consumption has stood at the head of the list as a cause of death ever since the state has had any accurate system of registration.

This disease has always been regarded as the most fatal with which we have to contend, but it is gratifying to be able to show that in recent years its mortality has been very materially reduced in New Hampshire, as well as in other states where efficient sanitary work has been done, and where the people have been enlightened as to the true nature of this malady.

The greatest number of deaths from this disease in one year in New Hampshire was in 1884, when 865 deaths were registered, while the smallest number occurred in 1899, when there were 582 deaths, or 283 less than in 1884.

We insert Table No. 2, which gives the mortality from this disease, the percentage of deaths to deaths from all causes, and the rate per each 10,000 of the population, from 1884 to 1899, inclusive:

TABLE No. 2.

Mortality from Consumption from 1884 to 1899, inclusive.

Years.	Deaths.	Percentages of deaths to deaths from all causes.*	Death rate per 10,000 living population.
1884	865	14.01	24.18
1885	857	13.82	23.68
1886	809	12.58	22.17
1887	766	11.82	20.32
1888	742	10.82	20.01
1889	651	9.72	17.42
1890	825	11.19	21.91
1891	695	9.51	18.31
1892	736	9.21	19.24
1893	737	9.62	19.13
1894	714	10.35	18.38
1895	693	10.00	17.71
1896	679	9.99	17.22
1897	697	9.92	17.55
1898	607	9.00	15.16
1899	582	8.26	14.43

* Still births and premature births have not been included in these calculations since 1893.

It will be seen that there has been practically a steady diminution in the number of deaths from this disease for the period given, the chief exception being in the year 1890, when the epidemic of influenza increased the mortality from consumption.

BY COUNTIES.

A study of the mortality from consumption by counties shows that, while it fluctuates more or less from year to year, the greatest death rate occurs in those counties having the largest manufacturing interests, Hillsborough leading, in 1899, with a percentage of 9.59 to the total mortality of the county, while Strafford follows with a rate of 9.18; Rockingham, 8.91; Grafton, 8.01; Belknap, 7.58; Merrimack, 7.33; Cheshire, 6.88; Sullivan, 6.62; Carroll, 6.55; and Coös, 5.99.

BY SEX.

Of the 607 who died of pulmonary consumption in 1898, 257 were males, and 350 females. In 1899, of a total of 582, 292 were males, and 290 females.

BY AGE.

In 1898: under one, 11; one to five, 14; five to ten, 1; ten to fifteen, 7; fifteen to twenty, 46; twenty to thirty, 181; thirty to forty, 143; forty to fifty, 66; fifty to sixty, 52; sixty to seventy, 47; seventy to eighty, 22; over eighty, 7; not stated, 10.

In 1899: under one, 11; one to five, 15; five to ten, 0; ten to fifteen, 11; fifteen to twenty, 46; twenty to thirty, 169; thirty to forty, 103; forty to fifty, 80; fifty to sixty, 65; sixty to seventy, 38; seventy to eighty, 28; over eighty, 10; not stated, 6.

NATIVITY.

In 1898, 421 of the decedents from consumption were American-born, 144 foreign-born, and 42 with birthplace not stated.

In 1899, 391 were American-born, 154 foreign-born, and 37 not stated.

CIVIL CONDITION.

In 1898 the record shows that 302 of the decedents were married, 231 were single, 57 were widowed, and 17 not stated.

In 1899, 268 were married persons, 225 single, 56 widowed, and 33 not stated.

GENERAL REMARKS.

The causes which have contributed to the reduction of the mortality from consumption are probably many and may be more or less complex. It is not our purpose to discuss to any extent this phase of the question. We must, however, assume that the prime factor in bringing about this result is a more thorough understanding of the true nature of the disease and the measures necessary to prevent its spread, together with generally improved sanitary conditions. The importance of pure water, good drainage, and ample ventilation is much better understood and more consistently carried out than formerly.

The infectious nature of tuberculosis is recognized, and the sanitary care of individual cases is, in many instances, such as to protect more thoroughly the members of the household than heretofore. It is probably a knowledge of these various essentials to good sanitation, coupled with many others not mentioned, that has led to these splendid results.

The State Board of Health has distributed throughout New Hampshire a great many thousand copies of a circular on the prevention and restriction of consumption, besides incidental articles on the same subject, all of which have been more or less extensively disseminated also by the public press, resulting, without question, in giving the public a more widespread knowledge of this disease.

We believe these to have been the chief factors in the reduction of the mortality from consumption.

PNEUMONIA.

Pneumonia as a cause of death stands second in the list, taking the average for a series of years. In 1892 and in 1899

it took first place, leading all other diseases in point of mortality. There were 890 deaths from this cause in 1892, and 753 in 1899. The tremendous mortality of 1892 was due, in a greater or less degree, to the effects of the epidemic of influenza which prevailed that year. The same influences prevailed, but less extensively, in 1899, there being in that year 170 deaths due directly to influenza, *la grippe*, a greater number of deaths than has occurred from the latter disease since 1892. It will therefore be seen that the prevalence of influenza has added largely to the mortality from pneumonia.

The death rate from this disease is in itself of alarming proportions, the average annual number of deaths for the past sixteen years being 617 from this cause. An examination of the registration statistics shows that the mortality from this disease has averaged considerably greater during the past ten years than for the period prior to that time.

Table No. 3 gives the mortality from pneumonia, by counties, since 1884:

TABLE No. 3.

Mortality from Pneumonia, by Counties, from 1884 to 1899, inclusive.

COUNTIES.	YEARS.																Average.
	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	
Rockingham	45	63	77	70	83	66	90	77	96	88	83	83	65	83	62	83	76
Strafford.....	39	48	37	46	52	38	80	73	96	65	66	58	64	68	56	75	60
Belknap	18	24	25	44	50	37	42	28	55	31	46	29	28	27	33	30	34
Carroll	30	27	15	33	46	49	37	42	50	19	32	28	22	28	23	41	33
Merrimack	50	72	60	85	73	86	94	73	137	95	85	83	73	70	53	86	86
Hillsborough....	110	128	112	128	129	132	158	185	175	159	154	175	159	189	154	228	154
Cheshire.....	36	52	39	55	55	52	44	54	86	64	50	44	25	38	30	61	49
Sullivan.....	21	22	23	22	30	31	32	31	62	45	31	32	23	36	25	37	32
Grafton.....	66	48	54	52	77	64	74	53	84	71	53	66	61	75	54	59	63
Coos	21	20	24	21	33	26	52	57	49	48	33	41	37	36	34	53	37
Total	436	504	466	556	628	582	703	673	890	685	633	639	557	650	524	753	617

BY AGES.

Of the 753 decedents from pneumonia in 1899, 130 were under one year of age, 97 between one and five, 19 between five and ten, 9 between ten and fifteen, 19 between fifteen and twenty, 25 between twenty and thirty, 39 between thirty and forty, 46 between forty and fifty, 50 between fifty and sixty, 85 between sixty and seventy, 129 between seventy and eighty, 99 over eighty, and 6 not stated.

A noticeable fact in connection with these figures is that this is a disease chiefly of infancy and old age, especially of the latter. The mortality from pneumonia in persons over seventy years of age is exceedingly large, far exceeding, in proportion to the population, that of any other period of life.

BY MONTHS.

In 1899, 168 of the deaths from this disease occurred in January, 114 in February, 82 in March, 91 in April, 44 in May, 25 in June, 28 in July, 17 in August, 24 in September, 35 in October, 28 in November, and 97 in December.

Of the 9,346 deaths from pneumonia during the years 1884 to 1899, inclusive, 4,267 occurred in the quarter embracing the months of January, February, and March, 2,502 in the quarter including April, May, and June, 746 in the quarter of July, August, and September, and 2,344 in the quarter of October, November, and December.

BY SEX.

Of the 753 decedents from pneumonia in 1899, 357 were males, and 396 females.

APOPLEXY.

Under the head of apoplexy and cerebral hemorrhage, 376 deaths are recorded, and under paralysis 251, a total of 627. Prior to 1891, the annual number of deaths from apoplexy was considerably below 300, the highest, in 1890, being 263. The average for the past sixteen years has been 284, while the number for 1899 exceeded this by 92.

There has not been the same variation in the number of deaths from paralysis for the period given. The number returned for 1899 was 251, while the average for the past sixteen years was 241.

Heart Disease.

Six hundred and eighty-five deaths were returned from this cause in 1899, a greater number than was ever before returned under this head, and which placed this disease second in rank of mortality for the year. Prior to 1893 the annual returns under this head were between 400 and 500, while since 1893 between 600 and 700 have been recorded. From 1894 to 1899, inclusive, the average annual number of deaths from heart disease has been 591.

Old Age.

Under this head were returned, in 1899, 371 deaths, of which 157 were males and 214 females.

Cholera Infantum.

This disease claimed 364 victims, as against an annual average of 370 for the past sixteen years. The mortality from this disease is confined chiefly to the cities and larger towns, by far the largest mortality being in the city of Manchester, although for the year 1899 the number was reduced to 92 in that city, as against 136 for the previous year. The heaviest mortality, in proportion to population, was in Somersworth, against which is recorded 34 deaths from this disease.

Of the 364 decedents, 310 were children under one year of age, 45 between one and five, and 9 between five and ten.

Cancer.

Two hundred and seventy-nine deaths were returned from this disease in 1899, as against 305 in 1898, the latter being the highest number ever recorded in a single year. The death rate from this disease has been remarkably uniform for the entire period covered by the registration reports. The lowest

mortality was 203, in 1888. Probably in no other disease recorded has the mortality been so uniform, although there has been a slight tendency to increase.

Accident and Negligence.

These were chargeable with 247 deaths in the year 1899, as against 270 in 1898.

Cephalitis.

Cephalitis, including meningitis and cerebritis, caused 219 deaths in 1899, and 222 in 1898, with an annual average since 1884 of 181.

Infantile Debility.

This was the cause of 196 deaths in 1899, and 147 in 1898.

Bronchitis.

In 1899 there were 185 deaths from bronchitis, of which 85 were males and 100 females.

Influenza.

From this cause there were 170 deaths in 1899, and 51 in 1898. This disease, like pneumonia and bronchitis, is most fatal among the young and the aged.

Bright's Disease (Nephria).

Under this classification were returned 151 deaths in 1899, 85 males and 66 females. By ages the record is as follows: Under one year, 1; between one and five, 1; between fifteen and twenty, 4; between twenty and thirty, 9; between thirty and forty, 8; between forty and fifty, 12; between fifty and sixty, 22; between sixty and seventy, 33; between seventy and eighty, 46; over eighty, 14; and one, age not stated.

It will be seen in this connection that this is essentially a disease of old age. It is probable that most, if not all, of the cases occurring in early life are the sequel to some other acute disease, as, for instance, scarlet fever.

It may be interesting to note that there has been an apparent increase in kidney diseases, the largest number, relatively, ever registered having been reported in 1899, when the total number of deaths from Bright's disease, nephritis, and other diseases of this organ, was 289, being double the number returned during the earlier years of the registration period.

Brain Diseases.

Under this indefinite term are classified all deaths from diseases of the nervous system not included under cephalitis, cerebritis, apoplexy, paralysis, insanity, chorea, epilepsy, tetanus, or convulsions.

Under this general term are included deaths from disease of brain, anæmia of brain, organic disease of brain, sclerosis of brain, softening of brain, structural disease of brain, tumor of brain, etc., etc.

The record for the past sixteen years shows a very gradual increase in deaths from diseases of the nervous system, the largest number ever reported being in the year 1899, with a total of 1,111 deaths, while the average for the past sixteen years has been 949.

Atrophy and Debility.

Under this head were returned 107 deaths for the year 1899, chiefly of aged people. This does not include deaths from infantile debility.

Convulsions.

One hundred and three deaths were reported from convulsions in 1899, as against an average of 84 for the entire registration period.

A very great majority of the deaths so returned occurred in infants or young children, due, doubtless, to improper feeding, dentition, and various other causes incidental to infant life.

This term is, in itself, unscientific, reveals nothing concerning the pathological nature of the illness, and is only a record of the chief symptom in the fatal result. The primary cause of death in such a return is not disclosed.

Typhoid Fever.

For the year 1899, 92 deaths are classed under this head, which includes, also, deaths from bilious fever, typho-malarial fever, and malarial fever. Excluding these latter causes of death, there were returned for the year only 76 deaths from typhoid fever for the entire state, a record exceedingly gratifying, and almost remarkable, considering the prevalence and mortality of this disease less than a generation ago. The average number of deaths annually reported for the past sixteen years has been 132.

As is well known, this disease finds its victims chiefly between the ages of fifteen and fifty, although probably no age is exempt from it; but its occurrence in children under five years of age is exceedingly rare.

Modern sanitary work is to be given the credit for lowering to such a marked degree the prevalence and death rate of typhoid fever.

Diarrhea and Dysentery.

Under these heads were recorded, for the year 1899, 76 deaths; 50 under diarrhea and 26 under dysentery. The average number of deaths from these diseases for the registration period has been 48 from diarrhea and 51 from dysentery. The number of deaths from dysentery in 1899, 26, was less than ever before reported in a single year.

Diphtheria.

For the year 1899 there were returned 55 deaths from diphtheria, a less number than has ever before been reported in a single year, and is a very gratifying showing. The largest number returned in a single year during the registration period was in 1889, when there were 210 deaths from this disease. Since that year there has been a gradual diminution in its mortality.

Of the 55 deaths returned in the last year, 3 were under one year of age, 32 between one and five, 12 between five and ten, 4 between ten and fifteen, 1 between twenty and thirty, 1 be-

tween forty and fifty, 1 between seventy and eighty, and 1 with age not stated. It will be seen at a glance that this is a disease of childhood.

It is not unreasonable to believe that the active and intelligent war which has been waged against this disease has contributed very largely, if not entirely, to the results accomplished. In other words, isolation and disinfection are important factors in the sanitary management of diphtheria.

Croup.

In 1899 there were returned from this cause 47 deaths. Ten of the decedents were under one year of age, 32 were between one and five, 4 were between five and ten, 1 between sixty and seventy.

Membranous croup is now classed with diphtheria, and the same precautions are taken in the sanitary management of the diseases. It will be seen that its mortality is confined to children, practically, and in that respect corresponds with diphtheria.

The foregoing is a very brief review of the twenty most prominent causes of death for the year 1899. It is a matter of note, however, that some other diseases that attract public attention, and against which sanitary warfare has been and is being waged, have a mortality too small to be included in the above group.

For public information, we cannot overlook scarlet fever, with a mortality for the year 1899 of only 20, and measles, with 15 deaths for the same period.

There is one communicable disease, however, that has not received the public or the sanitary attention that it deserves, and that is whooping-cough. The returns for the year 1899 show 74 deaths from this disease, of which 48 were in children under one year of age, 21 between one and five, 1 between five and ten, 1 between thirty and forty, and 3 with age not stated. In view of the large mortality from this disease, it would seem that some restrictive measures should be adopted; that at least children afflicted with it should be excluded from

the public schools. While it is apparent from the records that the mortality is almost wholly confined to children under school age, still it is certain that the disease is sometimes widely spread in the school-room, and thus carried to many homes that would otherwise escape.

For the consideration of diseases not mentioned in this report, and for a further study of those that are here discussed, reference should be made to the Registration Report.

DUTIES THAT LOCAL BOARDS OF HEALTH OWE TO THE PEOPLE

IN REGARD TO SCHOOLHOUSE HYGIENE AND SANITATION.*

By John H. Leal, M. D., Rochester, N. H.

The fact that a [redacted] at maturity well developed [redacted] be or

wear, and strain which it will stand under the most adverse circumstances is simply marvelous. In a great many cases the various parts are made to undergo tremendous strain and still the machine continues to work. But like all machines devised and constructed by men, the quality and quantity of its production depend upon its structure and the manner in which it is operated.

You plant two fruit trees from the same nursery and of the same variety, one of them in a pasture unprotected, the

* Read before the N. H. Association of Boards of Health.

other in a field well cultivated. The chances are that both will live and mature, but life and maturity in the one case do not mean the same that they do in the other. Note some of the differences:

1. The tree in the pasture will be smaller than the one in the field.
2. The fruit will be smaller.
3. There will be less fruit from year to year.
4. The flavor will be much inferior.

And still the fruit from the tree in the pasture will be superior in size and flavor to that from some other trees of different varieties in the field which is well cultivated. The above facts simply prove that in the case of the fruit trees two factors are necessary for a production, viz., the plant and the development, either of which is very important. You ask, What does such talk as this have to do with the subject of schoolhouse hygiene and sanitation? I answer, Nothing, absolutely nothing. But I am endeavoring to show by analogy that the fact that Daniel Webster was reared in the state of New Hampshire before the subject of sanitation in any form or the question of education had made much progress in the state, is no evidence whatever that his sanitary surroundings and educational advantages were satisfactory and should not be improved.

We come in contact daily with those people who argue that what produced excellent results in the past are good enough for the present and future; that because some boy whom they knew attended the district school three months in the year for but a few years, and had no other educational advantages, became a prosperous business man in one of our large cities and accumulated a large fortune, or became a brilliant lawyer and perhaps honored himself and his native town in the halls of congress, or attained other positions equally as honorable and as difficult to fill, is sufficient evidence to them that such educational advantages are good enough for the present and future. No reasoning is or could be more erroneous. It is not my purpose to speak of schoolhouse hygiene and sanita-

tion. This phase of the subject is covered by another paper. But I am endeavoring to show reasons why all modern means and methods in this direction of progress should be adopted, and therefore substituted for those which were never absolutely right, but right because none better were known. In many branches of science, what were considered as facts, and so taught ten years ago, are now known to be false. They were facts then because they gave the best results; they are false now because other means and methods give far better results.

Ours is an age of progression. The demands and requirements for success in any walk of life have been, and are still, rapidly increasing, and at the same time, and with the same degree, the opportunities for attaining those requirements have been growing less.

A few years ago many of you and myself made school teaching an occupation by means of which we earned money to assist us in the study of our profession. School teaching for us was then an opportunity. How is it today?

Then the single requirement in many locations was to knock down and quiet rebellious students. I speak from experience, for I have been employed to teach school where that was the principal consideration. Had the requirements been more we should never have been able to comply with them. Teaching is rapidly becoming a profession which is taking its rank with others, and in another quarter of a century the requirements of a school teacher will be such that he or she who enters the ranks of school teachers will be obliged to take a course of training which will be so exacting as to prohibit their undertaking any other work. I speak of school teaching as an illustration of the tendency of the times. What is true of this is true of every other branch of labor except the least skilled.

I think there is no class of men which obstructs the wheels of progress and improvement to so great a degree as the so-called self-made men. It is seldom that you find one who realizes that opportunity was a great factor in his success. Should he be candid with himself and review carefully his

career, he would find reason to be thankful for his surroundings and for the train of circumstances connected with his existence. But instead of doing so he looks at results and takes pride in what he believes to be a fact, viz.: That his path from birth has been filled with obstructions, and that nothing but his marvelous efforts has overcome them. It has been said by some wit that the foible of self-made men is their admiration for their creator; they are very apt to think that their ways and methods are the only ones which lead to success, and that the lives of which they are examples are the only ones worth living. Their aims are usually in a financial direction, and their estimate of one's success is measured by the size of his bank account. They are educated in one direction, and in this they are a success. But the fact that they are successful in this particular direction is no more evidence that they are competent to give advice in other directions than it would be reasonable to presume that because a man is a skillful physician he must be a bright and learned lawyer. Undoubtedly it is a fact that what has been done in the past could be done in the present and future, under similar circumstances and general conditions. But such circumstances and conditions do not now exist, and never will again. Attainments which in the past have been satisfactory are at the present time thoroughly unsatisfactory. At the present time they are more exacting, and the energies required to produce them are correspondingly greater. The time has been when energy or force could be squandered and the one squandering it would still have enough left to accomplish certain results, viz.: The requirements in that particular direction in which he is working. While attending school he could suffer from eye strain, due to insufficient and improper light, and remain out of school a portion of the time on account of headaches due to the eye strain. Or he could suffer from oxygen starvation and be poisoned by the impurities of the atmosphere due to imperfect ventilation, or no ventilation at all, and still live. He could not only live, but he could be so stupefied by the poisonous effects of the impurities in the atmosphere of some of the dun-

geons termed school-rooms, in which he was obliged to reside according to law, that he could sleep a large part of the time and still have energy enough left to accomplish results satisfactory, because others could do no better. Could the people understand, as you and I do, the injury which their idols are suffering from the want of hygiene and sanitation of some of our school buildings, as members of local boards of health our happiness would be much disturbed. We should be condemned by an enraged people for allowing such conditions to exist as do in and around some of our school buildings. When we stop to consider the energy squandered by the children in some of our school-rooms, sufficient in some cases to wreck the physical structures of those who might become, under more favorable and thoroughly practical conditions, well developed physically and mentally, we, as legal guardians of the conditions, must be impressed with the responsibilities incumbent upon us as members of local boards of health. It is not necessary for one attending school to be stricken down with typhoid fever, diphtheria, or some other contagious or pestilential disease, that the deleterious effects of unhygienic and unsanitary surroundings may thus manifest themselves. Such manifestations are apparent to all. But there are other manifestations of injury from unhygienic and unsanitary surroundings more insidious but as surely significant of irreparable damage to the individual as the membrane in the throat is significant of diphtheria. To some of us they are apparent, and therefore a matter of knowledge. To others, by no means less intelligent or uneducated, the facts are not known. The great mass of the people are honest, and intend to do for themselves and for others as well as their knowledge will permit them to do.

We are all dependent beings. We cannot all be educated in the same direction with satisfactory results. Some must be farmers, others mechanics, others professional men, etc., all of which are necessary, and therefore their vocations are equally honorable. They are necessary from the fact that the welfare of all depends upon the skill of each in his particular vocation and his performing his part as well as his knowledge

permits him to do. A want of knowledge by any individual concerning a particular subject does not imply, by any means, that he is an ignorant man. Every man is dependent to some degree on his fellowmen, and in return has obligations to perform toward his fellowmen.

As members of local boards of health, among other obligations which we owe to the people, one is of vital importance to them both as regards the present and the future. I refer to the subject of schoolhouse hygiene and sanitation. It is our duty not only to give to them what they demand in the right direction, but to give to them what we know to be for their best interests even against their will. If we fail to exert our strongest efforts in what we know to be right and proper, we are not fulfilling our obligations to the people, and in justice are forfeiting any claim which we exact from them.

SCHOOL HYGIENE AND SANITATION.*

By D. E. Sullivan, M. D., Concord, N. H.

In speaking on this subject before a gathering of medical men, a distinguished physician very recently said: "We are confronted with hygienic and sanitation attempts by unenlightened individuals, or, worse, a barbaric ignorance and a reckless indifference to the laws relating to health and to human life." These are harsh words, and, whether justified or not by the actual condition of things, should stimulate us as medical men and sanitarians to assert ourselves in this matter. If we shrink from political life because of its many unsavory attachments, and therein find some excuse for our indifference, we cannot plead that in extenuation of our lack of interest in this line of duty. We all admit the vital necessity of a good education, and are desirous to have it of the highest order in every respect; but how do we show our public spirit, our love for the schools? By never attending school meetings, rarely, if ever, visiting a school, and not knowing anything of the sanitary arrangements of the buildings? Granted there is no great incentive in some localities to do these things, yet our regard for the welfare of the innocent children should prompt our pleadings and active intervention. Physicians on boards of education are few and deserving of a larger representation. Schools and, of necessity, the scholars are suffering today for lack of counsel and advice on sanitary matters, such as members of the profession can give them.

Not a few of our schools, even in the principal cities boasting of their refinement and culture, are filthy and unhealthy, and in so far as uncleanliness goes give reason for the accusation made at times that they are ungodly. So rapid is the progress of the times that advances in every walk of life are being

* Read before the N. H. Association of Boards of Health.

constantly made; but our schools in their physical condition, their sanitary surroundings and the care of young minds are not keeping up with the procession. The state superintendent of schools of Maine, in his late report, mentions vile physical surroundings as one of the great evils from which the common schools are suffering. Since practical knowledge is acquired as much by observation as from books, may not this in some measure explain the alarmingly large proportion of illiterates in our state? How often is a site for a school determined upon because of its quiet neighborhood, exposure to light, character of soil, ease of drainage? When is a sanitary official, or even an architect, consulted about it? Yet there can be no more important step in the building of a schoolhouse than its proper location; and if this first move is not rightly considered, we must expect such unsanitary conditions as exist today.

The utter lack of interest in the ordinary observances of cleanliness is one of the most deplorable features of our educational system, and it was not surprising to see a Manchester lady recently express through the newspaper her thankfulness that an epidemic of scarlet fever there gave the board of health an opportunity to clean the schoolhouse. Soap and water are too sparingly used. Once a year is there a general cleaning. In sweeping, wet sawdust is rarely used; and in dusting, damp cloths never, so that the dust is kept circulating from floor to furniture, and return.

Ventilation.

When we consider the evil effects of vitiated air on young systems whose expanding brains are already overstimulated by excessive study, it seems criminal neglect to fail to provide a sufficient amount of pure, wholesome air; yet how many schools are there with proper ventilation? In the Union school district of Concord there are five schools with no ventilation except that afforded by doors and windows. Within two miles of this state house there is a school, two rooms of which contain seventy to eighty pupils, and their air is furnished through four registers aggregating 312 square inches in area. Each child receives about one fifth the amount of fresh air he needs.

Not only are the little ones denied anything like a reasonable supply of oxygen, and in that atmosphere forced to bend all their energies in acquiring some things difficult to comprehend, but they are also refused proper relaxation in out-of-door exercise. We easily see the need of frequent breaks in their close application to work, know their nervous systems are in such a condition as to be unable to profit by a continuance at study, realize positive harm is befalling them,—and still the evil goes on.

As if to make a bad condition worse, it is now fashionable in school circles to omit the recess in the afternoon, and apparently all efforts are bent to keep the child at his books as long as possible without outdoor play. The bell is rung five minutes before the hour for commencing school. No provision is made for a playground in inclement weather. The child is even prohibited the use of a large yard surrounding the school because the grass will be trampled down, and exterior appearances must be maintained at whatever cost, even at the risk of his bodily injury while sporting in the public street. Again, teachers do not sufficiently encourage their scholars to go out at recess. Unless requested by parents, they should not be allowed in the school-room at this time. As a writer of experience says: "Recreation makes the best work possible. Drudgery hurts and does not help. We may easily quadruple the value of our schools by studying to keep pupils fresh." To quote Prof. Frank H. Hamilton: "Calisthenics may be very genteel, and romping very ungenteel; but one is the shadow, the other the substance of healthy exercise."

More interest should be taken in their games, new ones provided, and the instructor in physical culture have the control and management of them. We would expect in this era of athletics that every city had such a teacher, but, unfortunately, a sound body to be the habitation of a sound mind is not thought to be as necessary as a knowledge of cooking, sewing, and singing. The coming generation will look back on this with awe and reverence, amazed at its phenomenal achievements in the arts and sciences, but will stand aghast in contemplating its stupidity in the care of schools and scholars.

The leading educators of the country add their testimony to the physician's that young children should have a period of relaxation every hour, and, when practicable, out of doors. At present there is in most of the common schools one continuous session of two hours in the afternoon, and if, for what is deemed good and sufficient reason, the teacher wills, it is made two and one half hours. The child is not only denied sufficient time in which to get home from school, eat his dinner, properly digest it, and return to his studies, but in that condition may be plunged into the exercise of his mental faculties for 150 minutes without an intermission. This is reason run mad. If the primal object of education is to create good citizens, upholders and champions of our laws and institutions, this is not the best course to pursue. Children will be unable to continue at school because of their physical and mental impairment; wrecked bodies and minds will be the fruits of such labors; our ideals will be shattered; the greatest good to the greatest number will not be attained. The writer wishes to enter his emphatic protest against the one session custom of high schools, as he knows of no one feature more detrimental to persons of their years, particularly the young ladies. Just at an age when they require all the vitality they can obtain, they are placed under such a system as robs them of their rosy cheeks and quickened eye, takes from them their regularity of eating and with it the desire to eat, binds them down to five hours of laborious work with twenty minutes' rest for lunch and recreation, and at the end of four years parades those that have survived before the public in dresses of immaculate white, in perfect harmony with their features. Most of these pupils come from homes where the noonday meal is the principal meal of the day, and in addition to being deprived of that sociability of the family gathering,—in itself a great aid to digestion,—an extra meal eaten hurriedly and in silence must be arranged.

From the standpoint of knowledge acquired, there is no doubt much more would be accomplished in two sessions, for it is well known after a long effort a brain is not in trim to

properly perform its functions, and impressions then made are evanescent and work injury to nerve tissues. What objection can there be to a return to the old system of having Wednesday afternoon for play? There are many advantages to a midweek rest, and as many disadvantages to a five days' course without this rest.

The laws of the state compel children of certain age to attend school so many weeks each year. The same laws should compel a proper observance of hygiene and sanitation on the part of those having charge of schools and not permit such gross violations of the ordinary rules of health as are seen throughout this commonwealth. Slowly, maybe, but surely is the vitality of these youths being sapped, their physical resistance to disease undermined, their brains dwarfed, and a future of invalidism provided for some of them because by force of legal enactments they submit to the ignorance or carelessness of incompetent supervision. The remedy for this is an inspection of all schools and scholars by qualified physicians at stated intervals, once a year at least, most preferably at the beginning of the school year, or, better still, at the beginning of each term.

There are today in every community a goodly number of children attending school when they should be at home under a doctor's care,—those suffering from the different anæmias, nervous diseases, so-called scrofula, impaired eyesight, etc. These may not be recognized by parents or teacher, and are aggravated by the methods of study and unsanitary environments. Many in their innocence are abusing that priceless gift, normal eyesight, placing themselves at a disadvantage with their companions, and entering on a life tied down to eyeglasses when all might be averted by an examination occasionally made under the direction of a specialist. Too close and too continuous application in dimly lighted rooms, at unsuitable desks, bad print on poor paper, blackboards between windows, and so much copying from them causing such rapid changes in the focusing of the eyes from the distant board to the near desk, have to answer for much of it. During the first fourteen months of school inspection in Boston, out of 66,790

pupils examined, 10,737 were found ailing; 2,041 of these were ill enough to be sent home, including 453 cases of contagious diseases.

There are too many avenues for the transmission of communicable diseases in most of our schools. Note the wide cracks in the floors filled with dirt,—perfect media for the development of micro-organisms. Witness the overcrowding: Fifty scholars in a room built to accommodate thirty, the extra twenty getting a limited supply of air by robbing the others, and at the same time adding the exhalations from their bodies to further contaminate it. Look at the old, dirty tin dippers and wooden pails from which the drinking-water is obtained. Remember that all pens and pencils are used in common without being disinfected, and while these and books are given them, yet they are not always allowed the same book, but may be given in the course of a term books used by all of their classmates. Certainly all of these wrongs can be righted by the expenditure of some thought, time, and money; and where the well-being of an army of future men and women is at stake, considerations of such nature should not stand in the way.

The ranking system in vogue today is not only unjust in its relation to the daily attendance, but presents grave objections on account of its liability to spread disease. Knowing that one half day's absence will keep his name from the honor roll, that sick child will insist that he is not sick, will refuse to have a physician, will continue in school until the disease has secured a firm hold, and, if of a contagious type, has seized other victims, and, finally, when obliged to remain at home, has his trouble intensified by his great disappointment in losing his reward. Even under present circumstances, much of this danger would be obviated if teachers were advised to send home all children ill, or having a suspicious cough or rash. If the cough be chronic, consumption would naturally suggest itself; and in the light of our knowledge today, scholars and teachers with incipient pulmonary tuberculosis are constant sources of infection and should be excluded from schools.

The customary examinations at the end of each term are undoubtedly frequent causes of nervous and other disorders, and have not enough of merit about them to warrant their existence. When we realize that children of seven years of age are subjected to these ordeals, we may justly estimate the state of mind of some of them and the dangers to which their nerve system is exposed. A child's capacity for promotion can be better tested by noting his work day by day, week by week.

Outside of the high school, there is not in some of our cities a male teacher connected with the public schools. Fully recognizing the ability of women, and giving them all credit for the noble work they are doing, there still remain many good reasons, from a hygienic view alone, why such a large proportion of young men and women should have the benefit of close association with a man as their instructor before the school door is forever closed on them. "It was a calamitous day for the children when the men were so largely excluded from the schools, and thus from vital and formative contact with them," says the Maine superintendent of schools in his report for 1898.

Comparatively very few buildings have seats and desks adjusted to the scholars; and while there has been introduced the vertical method of writing, its benefits will be almost *nil* while the old-fashioned furniture remains. Correct postures cannot be maintained; rounded shoulders, curved spines, headaches, and faulty positions in standing are encouraged, and the beneficial results of physical culture greatly lessened. There are today in this immediate vicinity schools with corridors serving as wardrobes, unheated and unventilated; recitation rooms for primary classes on the third floor, with all its dangers to health, limb, and life; outhouses connected directly with the schoolhouse; basements dark and foul from the odors of unsanitary urinals and water-closets, with this air mingling with the fresh air to be sent up heated to the rooms; drinking-water furnished in dimly lighted parts of basements; and study rooms insufficiently lighted and ventilated.

If our city schools cannot stand the test of modern times in sanitary matters, what must be the condition of the country

schools? We cannot believe they are any better than those of an adjoining state, where, after a personal examination, the superintendent of public instruction pronounced them bad in most instances. The outhouses are neglected, and do not tend to elevate the morals; the ventilation is by natural means, and the drinking-water declared to be all right if it be free from discoloration and odor. Recently an opportunity was given to drink some of this well water so loudly praised by the teacher, and a sample was sent to Professor Angell for examination. He certified that it was receiving sewage, and of course was unfit for drinking purposes. And yet, many intelligent people believe if there is no epidemic of scarlet fever, diphtheria, or typhoid fever every few months in a school, that is proof positive there can be nothing unsanitary about it. Within a fortnight, a man high in one of the learned professions said to the writer, "The best way to heat a school is with the old-fashioned stove." To combat such erroneous ideas, to spread the knowledge of hygiene and sanitation, and to give defenseless children protection against mental and bodily injury is a noble work, and one in which we should glory. The school of the future is to devote as much time to the development of brawn as of brain. There will be that harmonious blending of physical, mental, and moral development so necessary to a perfect manhood; the right to possess a sound constitution will be recognized; baths and gymnasia with medical supervison will be found in all cities, and instructors in physical culture as regularly appointed as other teachers.

FARM SANITATION.*

By Irving A. Watson, M. D.

In so brief a time as has been allotted me it will be impossible to more than very imperfectly discuss the more salient points relating to farm sanitation. I desire, however, to say, parenthetically, that it was my good fortune to have passed my earlier life upon a farm, and therefore I shall not speak in entire ignorance of the conditions to which I may allude.

We have incontrovertible evidence on all sides that many of our most destructive diseases, as well as a great array of physical conditions classed under the term "ill health," are largely preventable, and that with a better knowledge of sanitary requirements life would not only be saved, but prolonged, and happiness increased.

The fundamental principles of sanitation are few, and may be summarized as follows:

1. Pure air.
2. Uncontaminated water.
3. Clean soil upon which to live.
4. Individual hygiene.

Perhaps a somewhat more extensive classification might properly be made; but if the truths which these four propositions embody could be effectually and indelibly stamped upon the public mind, it would be a great stride for the human family. It is, however, necessary that these principles should be understood, to a certain degree at least, else no reason will be seen why they should be enforced.

Upon the first rests the entire subject of ventilation, the range of which, with the intricate problems that sometimes have to be solved before it is secured, give the subject a dig-

* Remarks made at the annual meeting of the New Hampshire Dairymen's Association at Peterborough.

nity little short of a science. It is surprising that pure air—one of the most abundant gifts of nature—should be so universally and systematically ignored; that in an age crowned with the most wonderful products of genius and invention, private residences, schoolrooms, public halls, churches, and all classes of buildings seem to be constructed, oftentimes, with a view to confining the effete products of respiration and surface elimination for the sole purpose of fitting the system to receive every form of disease by impairing its power of resistance.

The lack of ventilation is probably not an evil of such magnitude in the country as in the city; nevertheless, it exists, and often to a very injurious degree. Particularly is this true with respect to sleeping rooms, where, in some cases, great pains have been taken to exclude all outside air in order to economize heat. In doing so the individual has probably never recognized the fact that the air of a given space, as in a bedroom, for instance, is rapidly vitiated when occupied, unless some means is provided for the admission of fresh air.

Not only has the residence been made as impervious as possible to the outer air, but in some cases this debilitating system has been applied to stables, greatly to the injury of fine herds of cattle, as has not infrequently been found in this state by the cattle commissioners. Reference to this particular point will be made later.

It should be borne in mind that pure air is essential to perfect health, and that impure air is undoubtedly an important factor in unsuspectingly producing an impaired condition of the human economy.

The second and third principles referred to, to wit, uncontaminated water and clean soil, bear so intimate a relation to each other that they may be discussed together. The contamination of soil and water and the collection of garbage and decomposing and putrefying subtances may be said to constitute a group of dangers in themselves. These conditions will be recognized as threefold in their operations—poisoning the soil, the water, and the air.

Pure water is essential to the health and comfort of any community. There is no argument to the contrary. How such a desideratum can be acquired and maintained, is a problem which requires in some instances the closest application of sicence, as well as mechanical and engineering skill. It is conceded by the medical profession that contaminated water is the most prolific source of some of our diseases, especially of typhoid fever; but outside of the list of acute diseases, there is a great invalid corps which register their afflictions under the comprehensive term of "poor health," and who seem to have no acute or chronic disease. What demon has laid so oppressive a burden upon the nerve centers that half of life's function is smothered, and the physical energies nearly blotted out? I believe that contaminated water from the farm well is one of the prime factors in this unfortunate and distressing aggregation.

A close study of this subject for fifteen years has led me to believe that polluted wells are among the most prolific sources of illness and death throughout the state. The well is by far the most dangerous source of water supply, because of its close proximity to contaminating conditions. You have all seen the conventional sink drain and cesspool, and vault, and barnyard, and pigsty, and other unsanitary conditions in close and friendly relations with the family well, rendering it absolutely impossible to obtain other than contaminated water from such a source. We have often traced typhoid fever, intestinal troubles, and other diseases to a polluted well or spring. We have also seen it as a cause of insidious decay, progressive pallor, softened muscles, wasting strength, and slow enervation that so impairs the normal standard of health as to render life almost a burden. A well drains a certain area of ground, sometimes quite large in extent, and if this soil is not protected from contamination, it cannot be expected that a well will produce good water. The drainage from sources already mentioned is always a menace to the well. The State Board of Health has made an analysis of the water of a great many wells in this state, and the results show that a very large majority of them are more or less pol-

luted. We have known instances where entire families have lost their lives by contaminated drinking water, and many others where some member of a family has been made ill or carried off through the agency of a polluted well. For more than a decade the State Board of Health of New Hampshire has kept the water question before the people with very marked results, among which may be mentioned the fact that the annual death rate from typhoid fever has been reduced from what was once alarming proportions to only eighty-four deaths in the past year. There was a time when typhoid fever was very prevalent in the farming sections of the state, and in our smaller villages, in a proportion much larger than was found in our cities; but public water supplies have been put into many of our towns; the farmer has more general knowledge of the dangers of water pollution, and hence has sought a supply from some adjacent spring, or has dug a new well, or protected the old from further contamination, to the extent that, today, the rural districts of New Hampshire are as free from typhoid fever in proportion to their population as our cities. There is one thing which should be borne in mind, to wit: that the appearance and taste of a well water is no indication whatever of its purity. This, I think, is a matter not so well understood as it ought to be. Water may be contaminated with the germs of disease and the conditions discoverable only by a bacteriologist with the use of his microscope and cultures. The water may also be so heavily loaded with the soluble poisons of organic matters coming from a sink drain, barnyard, etc., as to make it dangerous to drink, and still its appearance and taste be excellent. Many cases of this kind have been reported, and so thoroughly investigated as to leave no doubt in the matter. While perhaps a normal amount of solids per gallon in good well water ranges from four to eight grains, we have seen water that contained over one hundred grains of solids per gallon, and yet the contamination could not be recognized by sight, taste, or smell. We have on record almost innumerable outbreaks of typhoid fever, some assuming proportions of great epidemics, like that in Plymouth, Penn., a few years

ago, to a single case in a family, all traced to infected water.

I wish to make this matter somewhat emphatic, because I think it is overlooked or underestimated by the farming community generally. Not only does the question of pure water bear directly upon the health of the household, but to the dairyman it has a still greater significance. It is important that cattle should have good water, also. Not only that, but it has been many times proven that typhoid fever from an infected well has been communicated to the milk supply, and an epidemic of the disease thereby created. So infinitesimal and numerous are the germs of this disease in an infected well that it is unsafe to use such water for washing milk cans, unless they are afterwards sterilized by the use of boiling water or steam.

In connection with the subject it may not be uninteresting to cite a case of this kind which occurred during the present year in this state. Several cases of typhoid fever appeared in the city of Manchester. The board of health, upon investigation, found that the families in which the disease appeared all obtained their milk from one milkman, who lived in an adjoining town. Investigation showed that this man obtained his supply from three farms, the sanitary conditions of which, so far as the milk question was concerned, were passably good on two of the farms but exceedingly bad on the other. The evidence was so conclusive that there seemed to be no room to doubt that the milk was infected. The driver of the milk cart, who frequently took a drink of the milk, contracted the disease and died. Upon the farm alluded to it was found that the well was badly contaminated from the sink drain. The underground box, which was supposed to conduct the sink water to the cesspool, passed within a few feet of the well, in a gravelly soil, and was there broken so the contents leaked into the soil and directly into the well. A chemical examination of the water showed that it was very badly contaminated by drainage, while a bacteriological examination revealed the germs of typhoid fever; thus, in an unexpected manner, the disease was distributed along the milk route. This is only one of many like instances on record.

Now, then, to summarize a little upon these points, we desire to impress upon the mind of the farmer that because he has some of the exceptional advantages in the line of health—of living in the country where the air and the water ought to be good—he must nevertheless intelligently understand the dangers which lurk about him. He should know the importance of good air to breathe and of clean, pure water to drink, and of a clean, dry soil upon which to live. The cellar should receive a great deal of attention, as it is often necessarily the repository of vegetables and products of various kinds, in order to protect them against freezing. He should give scrupulous attention to cleanliness in this respect. The removal of all decaying vegetables, the maintenance of as perfect cleanliness as possible, including, preferably, a coat of whitewash occasionally, and if the bottom is damp it should be concreted,—in fact, he should endeavor to maintain a dry, clean cellar.

The barn, barnyard, pigpen, outhouses, etc., should be, if possible, located at a reasonable distance from the house and on such a slope that the drainage will flow away from the house and from the well, if one is used upon the premises. If not so located special attention should be given to the construction of drains that will accomplish this purpose.

With strict attention to all these details, with the assurance of good water, proper ventilation, general cleanliness, healthful food, good habits, such a farmhouse ought to be a veritable fortress against the invasion of a large class of maladies.

But what about the contagious and infectious diseases, and what bearing has sanitation on them? The answer is, that with absolute cleanliness there is no place for the lodgment and distribution of the germs of at least some of the communicable diseases. In the first place, persons who live under good sanitary conditions are in such a state of health ordinarily that they are able to resist the invasion of disease to a very great extent. The so-called contagious and infectious diseases are mostly, if not wholly, due to microscopic germs, some of which are thoroughly well known today, and it is since the discovery of these microbes that the means for the

prevention and control of such maladies have been made more apparent. For instance, typhoid fever, diphtheria, and tuberculosis may perhaps be said to be the most pronounced type of germ diseases that afflict the people, although there are several others coming within this classification.

The germs of typhoid fever and diphtheria are pre-eminently among those preserved and perpetuated through certain filth conditions; therefore, in the absence of such environments, the danger of infection is greatly reduced if not entirely obliterated.

That these are facts is a question not open to successful controversy. The great strides that have been made in the suppression of many diseases, particularly since the discovery of their germ nature, is something which is known to everybody. Modern methods of sanitation now hold in check cholera, yellow fever, and the plague, besides limiting the extent and ravages of other diseases that might become epidemics.

By the introduction of public water supplies and thorough drainage, and the enforcement of general sanitary regulations, even great cities have been made practically immune from epidemics of the contagious and infectious diseases. Among the recent evidences of this may be cited the magnificent work done at Santiago by General Wood and at Havana by General Ludlow during the present year, in the control of yellow fever.

These great principles of the prevention of disease, which have been carried out in a magnificent manner by some of the cities of the world, are applicable to the smaller communities or to isolated families.

In what appears to be the simple principles of sanitation there are often problems of a perplexing nature to solve, and from these the farmer and dairyman is by no means exempt. The allusion which I have made to the spread of typhoid fever through the milk supply leads up to a question beyond that of the protection of the health of his own family to one of more or less public interest. The fact that the people are dependent upon the dairyman or the individual farmer for

their supply of milk, cream, and butter, places upon the producer a responsibility to the community which he cannot properly overlook or ignore. Modern farm sanitation exacts that the producer of these products, as well as of others, shall take all reasonable precaution to present these articles to the public in a clean and healthful condition. This necessitates clean barns and clean stables, especial cleanliness in the care of milk, which can only be secured by the closest attention to details. There is probably no production that is so susceptible to contamination as milk, for the reason that it is a medium readily infected with the germs of our most common communicable diseases. In fact, it is a typical fluid for the development of germ life after it has become infected. This is the reason why so many outbreaks of typhoid fever, scarlet fever, and diphtheria have been traced to milk supplies. In this I do not refer to those outbreaks in which suspicion was excited that the milk supply was infected, but to those in which such a cause was proven beyond question.

In the case of typhoid fever, the milk is, as I have already stated, susceptible to infection through water containing the germs of the disease. In diphtheria and scarlet fever it is believed that the germs of these diseases may be taken directly from an infected atmosphere, or by the handling of milk pans by persons convalescent from this disease, or in attendance upon persons afflicted with it. Many instances of this kind are on record, some of which I referred to a few years ago in discussing the question of milk from a sanitary standpoint before the New Hampshire Dairymen's Association, and which I think was published in the reports of the State Board of Agriculture.

Upon this point I may be permitted to give one recent illustration of infection through milk. There suddenly appeared in the city of Concord eleven cases of scarlet fever, when it was supposed that the city was absolutely free from the disease. These cases were not confined to any particular locality, but scattered indiscriminately about the city. An investigation by the health officer showed that every one of

the families in which the disease appeared obtained their milk from a certain milkman who lived out of the city. Of course this fact in itself was significant and might perhaps have been accepted as a reasonable solution of the question without further investigation; but it was thought best to ascertain the exact facts, so a representative of the State Board of Health visited the dairyman's home, and there found two children convalescent from a very mild attack of scarlet fever, with their hands still peeling from the effect of the disease. The milk was handled in a room adjacent to the kitchen, in a connecting shed, to which these children had access many times a day, and thus, without the least question, infected the milk which resulted in a serious outbreak of scarlet fever.

I believe it is only necessary for farmers and dairymen to understand these questions in order to have them, as a rule, use every precaution within their power against such possible accidents. Indeed, it can be said that within the last few years the sanitary conditions of dairies have been greatly improved, with results not only beneficial to the public but also to the producer.

I have already shown you some of the measures necessary to secure good sanitation upon the farm, and have alluded to the dangers of its neglect both to the individual family and to the public; I have discussed briefly the application of cleanliness and general sanitation to the prevention and restriction of some of the diseases with which you are all more or less familiar; but the half has not been told. In the list of the contagious and infectious diseases stands smallpox,—the least dangerous in a well-vaccinated community, yet the most terrifying,—but with smallpox, mumps, whooping cough, measles, scarlet fever, typhoid fever, diphtheria, and croup, as appalling as the list may seem, the total mortality of all these diseases combined does not cause in New Hampshire only about one half as many deaths as consumption or tuberculosis alone. The latter disease is the great, insidious, silent plague of our civilization, and stands at the very head of the list of those diseases destructive to the human family.

In proof of this, let me quote the actual figures from the death records of New Hampshire from 1887 to 1899—twelve years: Total number of deaths from smallpox, five,—less than one death in every two years from this disease. Why so small a mortality from this fearful malady which once ravaged every community in its great epidemics, disfiguring thousands of people for life? There is but one answer—vaccination has protected the people. Were it not for this beneficent protection we would still be afflicted with fearful epidemics of this disease. There is no other known protection against it; and, incidentally, let me say that the scientific method of preparing the vaccine virus in use today renders it impossible to communicate any other disease by this method, and therefore the objections that were once used to assail vaccination have been entirely and absolutely overcome. Every child above six months of age should be vaccinated, unless there should be some special reason to the contrary. It is the only known armor against smallpox.

But to return: Deaths from smallpox, 5; mumps, 7; measles, 260; whooping cough, 351; scarlet fever, 364; typhoid fever, 1,561; diphtheria and croup, 2,117; making a total of 4,665 deaths in twelve years from this group of diseases. But against this for the same period stands 8,542 deaths from consumption—almost twice as many.

I should also mention among the deaths included in the group of infectious diseases, that of cholera infantum, with a total for the period named of 4,715,—a disease confined largely to cities and compact localities, and not prevalent in rural localities. This could properly be discussed under city sanitation, and it is emphatically one of the so-called filth diseases.

Standing next to consumption in point of mortality is pneumonia, chargeable with 7,720 deaths for the period I have named. This is a disease which is widespread, attacking all classes, but preferably the aged, is now known to be a germ disease, and, like all other diseases of this class, does not find so favorable a field where sanitary conditions are good.

But to recur to consumption, or tuberculosis—the most fatal of all diseases afflicting both man and animals. In this you will be especially interested, since it is a malady more destructive to cattle than any other that prevails in the state. Much has already been said and written upon this subject, so that I assume you are well informed as to its nature. Still it is only by the repetition of facts that we are able to keep the subject constantly before the public, and to make that impression necessary to secure due care and consideration. Although the mortality statistics of this disease, which I have presented, are of alarming and fearful proportions, it is gratifying to be able to say that through the efforts which have been made during the past twelve years (and I name this period because for it our statistics are accurate) there has been a great reduction in its death rate. In fact, the deaths from consumption are now nearly two hundred less, annually, than a decade ago, which shows a most gratifying result from sanitary work.

I may be allowed to say, perhaps, that within a few years many thousand copies of a paper on "The Restriction and Prevention of Consumption" have been distributed throughout the state by the State Board of Health; lectures have been delivered, articles written, monographs published, the question discussed at meetings of various organizations, and, indeed, it may be said, that a veritable crusade has been waged against tuberculosis, with the splendid results that I have stated.

Everybody should understand that consumption, or tuberculosis, is a germ disease, and that in the human family it is distributed almost entirely, if not wholly, by infected sputum, and that by its immediate destruction, and with such care of details as is necessary to prevent infecting articles, the patient need not endanger the rest of the family. It is generally believed that aside from the sputa of the consumptive, tuberculous milk and meat are practically the only other sources of infection left. I am, however, individually of the opinion that the latter, as a cause of tuberculous infection, has been greatly overestimated. That these products are dangerous

when the animal has reached an advanced stage of the disease is doubtless true; but, fortunately, under our present system of handling this disease, its nature is discovered and the animal destroyed before a very dangerous state has been reached. It is also the testimony of other observers that they have been unable to definitely trace tuberculosis to infected milk or meat. On the other hand, there is experimental evidence which shows that it may be communicated in this manner to animals.

Now, as a matter of fact, cleanliness, coupled with good health, is the great and universal protection against tuberculosis. It is one of the diseases which easily establishes a foothold in unsanitary dwellings, dark and damp cellars, sleeping rooms, etc., in fact, wherever filthy conditions pertain. On the other hand, with a dry soil, dry and clean cellar, dry rooms, plenty of sushine, general cleanliness, healthful food, temperance—all combined, constitute the strongest barrier against the invasion of this disease.

Not only do these principles apply to the household but to the stable in the protection of cattle. Upon the latter point Hon. N. J. Bachelder, in the report of the cattle commission, states that after an inspection of over five hundred barns in New Hampshire during the past two years, he is convinced that lack of proper ventilation in the stable is the most prolific cause of bovine tuberculosis.

His experience in this direction is much more extensive than my own, but so far as I have investigated infected herds I am of the same opinion. I think this matter is a very important one,—one which should be fully understood and realized by stock owners. A stable containing a herd of cows made so nearly impervious to the outer air that the cattle are kept warm from their own animal heat, without the construction of any system of ventilation whatever, constitutes a veritable hothouse for the spread of tuberculosis, and with the infection once introduced into such a herd, its course through it must necessarily be rapid.

The same principles of protection against infection apply to cattle as to the human family. Good ventilation, sunlight,

and dryness are essential in either case. It is by sanitation, by creating and maintaining such conditions as are antagonistic to the growth and development of the germ of tuberculosis that this disease will be conquered, if it ever is.

But my limit of time is reached, and I confess to the feeling that I have scarcely more than outlined some of the great and important questions relating to farm sanitation; yet I am certain that I have presented some points worthy of your most serious consideration.

DIPHTHERIA BACILLI IN HEALTHY NOSES AND THROATS, WITH REPORT OF CASES.*

By Francis P. Denny, M. D., Brookline, Mass., Assistant in Bacteriology, Harvard Medical School; Bacteriologist of the Brookline Board of Health.

[This paper and the one following, by two eminent bacteriologists, relating to diphtheria and certain types of membranous anginas, contain so many important facts as to what bacteriological examinations have revealed in connection with these diseases, and which are of such vital importance to the physician and the health officer with respect to diagnosis, treatment, and sanitary precautions, that we have given them a place in this report. They demonstrate the great necessity for bacteriological examinations in every case of diphtheria, or of suspected diphtheria, and without which the best methods of treatment and the necessary sanitary precautions cannot be assured from the start.

Dr. Denny's paper, which is based upon practical experience, illustrates one way in which diphtheria may be accounted for without direct exposure to a prior case,—through infection carried in the throats of the well. It also shows that certain important questions, aside from the existence of the bacilli of the disease, may be determined by laboratory experiments.

Dr. Bissell's paper makes the point still more emphatic in showing that certain conditions of the throat, clinically simulating diphtheria in every respect, may be produced by other germs, and, consequently, a different treatment and management in every respect required.

These two papers, taken together, are exceedingly instructive in every particular, and prove most emphatically the importance of early bacteriological examination in every case of suspected diphtheria. I. A. W.]

The occurrence of virulent Klebs-Löffler bacilli in the throats of healthy individuals who have never shown any

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symptoms of diphtheria has given rise to much misunderstanding. It has led many to doubt the value of the diagnosis of diphtheria based on bacteriological examinations, and it has even been used as an argument against the Klebs-Löffler bacillus being the specific organism of the disease. It has given rise to many perplexing questions for boards of health. Many incorrect statements in regard to the significance and frequency of these cases are in circulation among the laity, as well as among the profession.

With our present knowledge the occurrence of these cases can be satisfactorily explained, and they are in no way inconsistent with the generally accepted theories of the disease. It is very desirable that there should be a better understanding of these cases among general practitioners that they may aid the boards of health in detecting these individuals and give their moral support in securing their isolation.

The question of the frequency of diphtheria bacilli in healthy throats is important because of the prevalent belief that there are *many* healthy individuals in any community who have the bacilli in their throats. It is therefore felt that these cases cannot be a great source of danger, and that it is unjust to insist on the isolation of the few who are by chance discovered. This belief is supported by most of the reports of cultures from healthy throats which are found in the literature.

Kober,* in a review of all the reports which he could collect, found that 7 per cent of all healthy persons who had *not* been exposed to diphtheria had Klebs-Löffler bacilli in their throats, while among those who had been exposed 18.8 were positive. Kober's own investigations showed only .83 per cent positive among the non-exposed and 8 per cent among the exposed. The cultures which are reported later in this paper show an even lower percentage of positive cases.

The high percentages found in the literature are partly to be explained by the fact that many of the cultures reported were made from individuals living in institutions or in crowded tenements of our large cities. The hygienic condi-

* Kober. Zeitscher. f. Hyg. 1899, Bd. xxxi, S. 431.

tions under which the individuals are living appear to stand in close relation to the frequency of these cases.

Another reason for the high percentages is that in many of the reports no distinction has been made between those individuals with virulent and those with non-virulent bacilli. It seems probable that in certain localities non-virulent forms of the bacilli are much more frequently found than in others. These non-virulent forms which morphologically are identical with true Klebs-Löffler bacilli may differ only in the absence of virulence, or they may show slight variations in growth on certain media, the most important of which is the failure to produce acid in sugar bouillon. Persons with non-virulent bacilli are probably not a source of danger. No one has ever succeeded in experimentally raising the virulence of bacilli when it has been entirely absent.

Diphtheria bacilli are most frequently found in healthy persons who have been exposed to the disease. Under these circumstances the bacilli are usually virulent. As cultures will seldom be made except from individuals known to have been exposed, the bacilli found in cultures from healthy throats are usually virulent. It is always well, however, to test the virulence of the bacilli found in those who have shown no symptoms.

The percentage of positive cases among those exposed depends largely on the hygienic conditions under which the individuals are living and also on the degree of exposure, which in any large series of cases cannot be accurately measured. The conditions of institution life seem especially to favor their occurrence.

It is now very generally believed that virulent bacilli may multiply in the throats and noses of certain persons without producing symptoms because these persons have a natural immunity from the disease. The bacilli multiply in their throats without producing symptoms just as they multiply in the throats of those convalescing from diphtheria. During convalescence the individual has a temporary immunity due to the accumulation of antitoxin in the blood during the acute stage. The antitoxin prevents the further development

of the disease, although virulent bacilli continue to multiply in the throat. It seems probable that the natural immunity which certain individuals seem to possess is also due, in part at least, to the antitoxic property of their blood, for Wasserman and others have found antitoxin in the blood of individuals who have never had diphtheria.

Wasserman* obtained blood from different persons by cupping, and inoculated diphtheria toxins in guinea pigs together with small amounts of the human serum so obtained. He found that one or two cubic centimetres of the blood of certain persons was capable of protecting a guinea pig against several times the fatal dose of toxins. The blood of some persons did not have this protective power. Abel,† Orlowski,‡ Loos,§ and Passini** have confirmed these observations of Wasserman.

In view of the fact that certain individuals have a natural immunity from the disease due to the presence of antitoxin in their blood, it is no more surprising that virulent bacilli should multiply in their throats without producing symptoms than it is that the bacilli should continue to multiply in the throats of those convalescing from diphtheria; the one has a *natural*, the other an *acquired* immunity.

The number of bacilli which may be present in the throat of a healthy person varies greatly. In some of the cultures which I have examined there have been only a few; in others they have been present in almost pure culture. As a rule, they are less than during the acute stage of diphtheria, corresponding in the number of bacilli present to mild or convalescent cases.

To what an extent are healthy individuals with virulent bacilli in their throats a source of danger? We know the Klebs-Löffler bacillus to be the specific organism of the disease. The virulence of the bacilli being the same, an individual is a source of danger in proportion to the number of

*Wasserman. Loc. cit., 1895, Bd. xix, S. 408.
†Abel. Deutsch. med. Woch., 1894, Nos. 48-50.
‡Orlowski. Loc. cit., 1895, S. 400.
§Loos. Wien. klin. Woch., No. 22.
**Passini. Ref. Baumgarten's Jahresbericht, 1896, S. 291.

bacilli which are given off from him. In an acute case of diphtheria when the child is coughing and gagging and the secretions are profuse the bacilli will be disseminated more than they are in the mild or convalescent cases. Still from the mild cases, and equally from healthy individuals, there is abundant opportunity for the bacilli to be disseminated. In coughing and sneezing and even, according to Pflügger, in speaking, the bacilli are scattered abroad. They leave the mouth on towels, handkerchiefs, forks and spoons, drinking cups, etc.

Cases have been reported by Park* and others where the infection can be traced almost with certainty to individuals who have shown no symptoms. Many outbreaks of diphtheria in children's institutions, which have persisted for a long time, despite the fact that all the sick children were promptly isolated and the rooms disinfected, have been quickly stamped out when the healthy children's throats were tested and those with the bacilli were isolated. There can be no question that *healthy individuals with virulent bacilli in their throats can give the disease.*

In our search for these cases it is not practicable to make cultures from every healthy individual. We can, however, make cultures from those who are most likely to have virulent bacilli in their throats and those are persons who have been exposed to diphtheria. It is especially desirable that physicians should make cultures from the well members of a family where there has been delay in isolating a case of diphtheria or where the isolation has not been thorough. The poorer the hygienic conditions under which the family are living and the more crowded the rooms the greater the need of making cultures. In institutions also where there have been diphtheria cases it is especially important that cultures should be made.

In examining a healthy person for the presence of the bacilli, cultures should be made from both throat and nose, as the bacilli may be present in the nose, while a culture from the throat is negative.

*Park. American Textbook of Practical Medicine, vol. 1, p. 647.

The giving of immunizing doses of antitoxin to all the well members of a household does not take away the need of making cultures. On the contrary, it is more important to make them under those circumstances. Antitoxin prevents the development of symptoms, but it does not prevent the bacilli multiplying in the throat. Already at the time the antitoxin is given the throat may be infected. The immunity conferred to persons otherwise susceptible prevents the development of symptoms which would lead one to regard these persons as infectious. I believe that it often happens that immunized individuals with abundant bacilli in their throats are allowed their freedom, when if no antitoxin had been given, symptoms would have appeared which would have led to their prompt isolation. To a certain extent, therefore, the giving of immunizing doses of antitoxin when not controlled by cultures may favor the spread of diphtheria.

The making of cultures from healthy individuals who have been exposed is especially important when these individuals, by their occupation or habits, are likely to spread the disease; such are school children, persons who handle articles of food, milkmen, servants, and nurses.

Nurses who have been taking care of diphtheria patients not infrequently have bacilli in their throats, although not developing the disease themselves. Ritter,* in cultures from eighteen nurses who had been caring for diphtheria patients, found Klebs-Löffler bacilli in two. Washburn and Hopwood† found two nurses with the bacilli among six from whom they made cultures. The danger from a careful trained nurse is not so much that the bacilli from the case she has been nursing are clinging to her person or clothing, but that the bacilli may be multiplying in her throat, where they may persist for weeks. It is customary to allow a nurse seven days for quarantine before taking another case. Personally, I should prefer to have a nurse two days after leaving a diphtheria case, from whose throat a negative culture had

*Ritter. Verhandl. d. X. Versamml. d. Gesellsch. f. Kinderheilk., Wiesbaden, 1894.

†Hopwood. Ref. Baumgarten's Jahresbericht, 1895.

been obtained, than one after two weeks without any bacteriological examination.

Another reason for making cultures from healthy individuals is to determine the source of infection of diphtheria. When a number of cases appear simultaneously among individuals associated together—for instance, in a family or in a schoolroom—and the connection with another case of diphtheria cannot be made out, one should always suspect that there is some individual with whom these cases have been in contact who is carrying the bacilli in his throat. Cultures should be at once made from those persons by whom the patients might have been infected. Often suspicion will point to a single individual as the one most likely to have the bacilli, or, again, it may be necessary to make cultures from a large number of individuals to find the source of infection.

Cultures from 285 healthy individuals were sent to the Brookline Board of Health Laboratory during the past year. The cultures from only seven showed the presence of diphtheria bacilli. For the information about these cultures I have been dependent largely upon the cards which were filled out and sent in by the physicians who made the cultures. I am also indebted to many of the physicians for information about the cases which has been given orally. With only these data it has been impossible to determine how many of the cases have been exposed, or to measure in any way the degree of exposure. It appears, however, that in a few of the cases only has the exposure been very great; in many it was very slight, and in the larger number only suspected.

These figures, therefore, are of no value as representing the frequency of the bacilli in those who have been exposed to diphtheria. They do show how seldom the bacilli are found where there is not great exposure in persons living in a suburban community under good hygienic conditions. If we exclude the cultures from fifty persons which were made in connection with two outbreaks of diphtheria, where the exposure had been considerable, and among whom six positive

cases were found, we have cultures from 235 healthy individuals with only one positive case (about 43 per cent).

Of these 235 healthy persons, 216 were children, 19 were adults. A large part of them were of the well-to-do class. Most of those of the poorer class from whom cultures were made were living in two and three family tenement houses with air on at least three sides, where the conditions are very much better than they are in any large city. The low percentage of positive cases is to be explained by the good hygienic surroundings under which the persons were living.

Of the seven positive cases, four were among thirty-eight adults from whom cultures were made by Dr. Chase in connection with an outbreak of diphtheria believed to be due to infected milk. These cases have been reported by Dr. Chase,* but as they illustrate very well how infection may be spread by healthy individuals, I shall refer to them briefly.

In October, 1899, two children in a milkman's family were taken sick with diphtheria and were sent to the hospital. Realizing that others in the same house who were handling the milk might have diphtheria bacilli in their throats, and that the milk might so be infected, Dr. Chase made cultures from all the well members of the milkman's household. All were negative at that time. About three weeks later a number of cases of diphtheria began to appear among the milkman's customers. Cultures were again made from the well members of the household, and three healthy men were found to have the bacilli. Two of these men did the milking. The bacilli in their throats were very abundant, and were shown to be virulent by the inoculation of guinea pigs. In four families among the milkman's eight Brookline customers, there were twelve cases of diphtheria; at least six cases occurred among his customers outside of Brookline. Dr. Chase has shown very clearly that these eighteen persons were infected through the milk by the bacilli from the two healthy milkers. A fourth healthy man with the bacilli in his throat was found by Dr. Chase among thirty-one adults who were known to have been exposed by drinking the infected milk.

* Chas e. Journal Massachusetts Association Boards of Health, April, 1900.

The three other positive cases were discovered among 174 healthy children in the public schools, from whom cultures were made by the school inspectors. During the recent epidemic, culture outfits have been kept at all the schools. When a school child has been taken sick with diphtheria the inspectors have made cultures from those children who have been sitting nearest the child. When more than one case has occurred in a room cultures have been made from all the children in that room. The cultures have been made under such circumstances with the double object of determining, if possible, the source of infection of the diphtheria cases, as well as to see if there might not be some who had the bacilli in their throats as the result of exposure.

Two of the seven cases were found in a room in one of the primary schools in which there was a small outbreak. On September 24, 1899, three children who had adjoining seats in the room were taken sick with diphtheria. The fact that the three became ill simultaneously made it seem probable that they had all been infected from some other child in the room. Accordingly, cultures were made from all the children, and it was found that two children sitting in seats adjoining the three sick children had positive cultures. Both were perfectly healthy. In one there was a doubtful history of a slight nasal discharge. It seemed probable that this child had infected the other four children sitting near it. The seventh positive case was a school child in whose throat the bacilli were by chance discovered, although as far as known there had been no connection with any case of diphtheria.

The virulence of two of the seven cases was tested with positive results. Four of the cases were in such close relation with cases of diphtheria that at the time it did not seem necessary to test the virulence, although for the sake of the record it is much to be regretted that it was not done in all. In the seventh case the bacilli were so few that I did not succeed in isolating them in pure culture. In all of the seven cases the bacilli were found to be present on more than one day.

The remainder of the cultures which I have to report were from 190 healthy boys in the Parental School in West Roxbury. It is a municipal school for truants. The age of the boys is ten to fourteen years. During the week beginning March 5, 1900, 10 of the 200 boys in the school were taken sick with sore throat, and cultures showed the presence of Klebs-Löffler bacilli. Four of the boys only had membrane. On March 10 and 11 cultures were made for me by Dr. Sleeper, the house physician, from the throats and noses of the 190 healthy boys. The cultures were examined by Dr. Hill at the Boston Board of Health Laboratory. Sixteen of the 190 cultures were positive. The occurrence of this number of positive cases in such an institution is a common experience. These cases are of interest, however, on account of their distribution in the school and the unusual opportunity which was given to determine what are the conditions of institution life which favor the occurrence of diphtheria bacilli in healthy throats.

The 200 boys live in three large new buildings. The cases of diphtheria were quite evenly divided in the three, but of the 16 healthy boys with the bacilli, 15 were living in one of the buildings. Investigations were therefore made to determine what were the conditions under which the boys in this building were living which were not present in the other two.

The boys in the different buildings are of the same age and of the same social class. They are together in the same day school. They do the same sort of work, and lead the same regular life. They have the same food, but have their meals in their own buildings. The only difference appeared to be in the building in which they lived.

Two of the buildings accommodate only 40 boys each. The hygienic conditions in these two buildings are exceptionally good. Each boy has his own separate sleeping room, measuring 10x6½x9 feet. A window, and an open door leading into a large, airy corridor, give excellent ventilation. The living rooms for day use are large, well ventilated, and sunny. Hygienically these two buildings would compare very favorably with the dormitories of most of our large

private boarding schools. Among the 80 boys in these two buildings there were five cases of diphtheria, or one half of all the cases that occurred. But among the 75 healthy boys there was only one who had bacilli.

Most of the remaining 120 boys live in the third building, which is larger than either of the other two. Here, instead of single rooms, there are large open dormitories in which the boys sleep. Thirty-five boys slept in each of two rooms measuring 40x30x12½ feet. There were 18 boys in a room proportionately smaller. The remaining 32 boys were scattered about in smaller rooms in the school. The large rooms were high studded and well ventilated. The cubic air space per boy was only one fifth less than in the buildings with the single rooms, and much larger than the boys would have in their own homes. The living rooms in the third building were considerably smaller than those in the other two, in proportion to the number of boys. All the buildings are kept exceedingly clean. The plumbing in all is new and in good condition. The boys in the third building appeared to be in as good physical condition as those in the other two.

Among these 120 boys there were five cases of diphtheria,—two with membrane and three with simple sore throat. Fifteen of the 115 well boys had positive cultures. The virulence of three of these cultures was tested. Two of them were virulent and the third appeared to be non-virulent.

The only difference which could be discovered in the conditions under which the boys were living which would explain the occurrence of the larger number of positive cases is that in the first two buildings the boys have separate sleeping rooms, while in the third building a large number of boys are sleeping together in the same room. The living together of a large number of individuals breathing the same air seems to be the condition of institution life which predisposes to the occurrence of these cases.

It might be supposed that the larger number of positive cultures in the third building could be explained by the greater exposure which must occur where persons are living together in such close contact. If that were so, however,

one would expect that there would have been a greater number of diphtheria cases in that building, while in reality there were proportionately fewer.

Evidently the boys in all three buildings had been exposed. One is therefore led to conclude that the bacilli becoming lodged in the mucous membranes of the boys living in the single rooms found the conditions favorable for their growth only in those who were susceptible. In those who had a natural immunity—in other words, in those whose blood possessed antitoxic properties—the conditions were not favorable and the bacilli did not multiply. On the other hand, in the third building, where large numbers of the boys were sleeping together, the bacilli found the conditions favorable for their growth in many of those who were naturally immune. Whether the more favorable conditions for the growth of the baclli were the result of local changes in the boys' throats, I was unable to determine. On inspection no difference could be noted between the appearance of the boys' throats in the different buildings, or in their general physical condition. Enlarged tonsils were exceedingly common throughout the school, but not more so in one building than in the others.

There is not time now to consider the question of what action boards of health should take in regard to these cases. I can only say that it has been the policy of the Brookline board to isolate all of those in whose throats virulent bacilli are found. It is believed that no other course can be consistently followed. The local conditions of the patient's throat or his constitutional symptoms are of no significance to boards of health. The only criterion of the disease from the point of view of the public health is the presence of the bacilli.

To briefly sum up the principal points which should be emphasized:

1. Diphtheria bacilli are seldom found in the throats of those who have not been exposed to diphtheria.

2. The bacilli are more frequently found in those who

have been exposed, especially in persons living under poor hygienic conditions or in institutions.

3. The conditions of institution life which favor the growth of the bacilli in healthy throats are the living together of a large number of persons in a limited air space.

4. Healthy individuals with virulent bacilli in their throats can spread the disease. They are just as dangerous as mild or convalescent cases of diphtheria, and ought, therefore, to be detected and isolated.

5. Cultures ought to be made among those who have been exposed to diphtheria: (*a*) By physicians, among the members of a family who have been exposed; (*b*) by inspectors in the schools; (*c*) by health officers under any circumstances when they think the disease is being or may be spread by such individuals.

In concluding I wish to express my thanks to Dr. G. S. C. Badger for his help in examining the Brookline cultures, to Dr. Hill for his reports of the cultures from the Parental School, and to Dr. Sleeper, the house physician at the school.

THREE VARIETIES MEMBRANOUS ANGINAS

PRODUCED BY MICRO-ORGANISMS OTHER THAN THE KLEBS-LÖFFLER BACILLUS, AND THEIR SANITARY SIGNIFICANCE.*

By William G. Bissell, M. D., Bacteriologist, Department of Health, Buffalo, N. Y.

That the diphtheria bacillus is not the only micro-organism capable of producing a pseudo-membranous inflammation, is a well established fact. Prior to the inauguration of the more exact microscopic methods for the determination of a diphtheritic infection, there were several varieties of pseudo-membranous inflammation of the tonsils classed as "diphtheria," which, by recent research, have been conclusively demonstrated to be produced by micro-organisms other than the Klebs-Löffler bacillus. The appearance of the membranes in these conditions is not dissimilar to that produced by the Klebs-Löffler bacillus, and the constitutional disturbance may be such as not to be capable of differentiation from that usually attending a severe case of diphtheria.

The micro-organisms in question are the streptococcus pyogenes, micrococcus of sputum septicemia, which belongs to the bacteria, and oidium albicans, a member of the fungi group. A Klebs-Löffler infection has been shown to be capable of wide variances in its clinical manifestations, and these organisms can, likewise, produce illness having a clinical picture varying from the most mild sore throat to a fatal disease.

In the experience of the Bureau of Bacteriology in this city, the oidium albicans has never produced a membranous

*Buffalo Medical Journal, December, 1900. By courtesy of Dr. William Warren Potter. Copyrighted 1900.

condition of the tonsils that has resulted fatally; but instances of streptococcus and sputum septicemic infections have frequently occurred, followed in several instances by death of the patient. These conditions cannot be classed with the contagious diseases in the true sense of the term, for though they are capable of transmission by direct inoculation, they do not appear to be communicable.

In the early part of March, 1896, the first investigation was carried on relative to a membranous condition of the tonsil, producing a severe clinical disturbance which resulted fatally. Dr. J. H. Potter of Buffalo submitted a culture, and examination revealed the presence of short-chained streptococci and staphylococci. Considering the illness to be diphtheria, he submitted a second culture, examination of which resulted as in the former instance. A small piece of membrane was found on the swab accompanying the second culture outfit, and examination revealed the presence of streptococci almost to the exclusion of any other organism. A diagnosis of a streptococcus tonsilar infection was made. On the seventh day of the disease, the patient, a child, died, the result of a general toxemia. Diphtheritic antitoxin had been administered on two different occasions without the slightest beneficial effect.

This being the first reported instance in Buffalo of death resulting from a streptococcus tonsilar infection, the facts in the case were submitted to Dr. Herman Biggs, director of the New York bacteriological health laboratories, requesting information as to whether similar instances had occurred in New York. Dr. Biggs replied that they had had several deaths from streptococcus toxemias, the tonsils being the seat of the primary invasion.

The following statement of Dr. Thomas Bagley, Buffalo, N. Y., contains an interesting account of a severe streptococcus tonsilar infection:

"February 11, 1900, I was called to attend a boy ten years of age. His parents stated that he had not been feeling well for about a day, complaining particularly of a sore throat. On examination, I found both tonsils enlarged, the right hav-

ing the ordinary appearance of a follicular tonsilitis, the left presenting in its central portion a very suspicious membranous patch. The temperature at this time was 104° F., pulse, 160, patient somewhat delirious and extremely nervous. On the second day, the general condition was worse, the temperature being 105° F.; pulse, 170.

"The right tonsil still retained the appearance of a follicular tonsilitis, but the left tonsil was completely covered with a dark grayish membrane resembling that usually seen in a severe case of tonsilar diphtheria. Becoming alarmed at the condition, two thousand units of diphtheritic antitoxin serum were injected, and a culture sent to the department of health for confirmation of diagnosis. On the following day a report was received that the culture did not reveal anything typical of diphtheria, but requested that a second culture be submitted. In the meantime, the membranous patch had extended to the pharynx, into the posterior nasal passages, entirely covered the soft palate, and seemed inclined to extend forward. The right tonsil was completely covered with a membrane.

"The case, clinically, resembled diphtheria. A second culture was submitted, and, at this time, I was successful in obtaining a portion of the membrane which was likewise delivered to the bacteriological laboratory. The patient's condition was rapidly becoming more serious. The following morning a report was received that there were no diphtheria bacilli in the culture. Examination of the membrane revealed streptococci to be present almost to the exclusion of other organisms.

"On the fifth day of the disease the temperature ranged from 103½° to 105° F.; pulse, 120 to 170. There was no change in the appearance of the throat. Local treatment had included the use of strong solutions of the subsulphate of iron, a mixture of carbolic acid and glycerine, several applications of Löffler's solution, and continual use of peroxide of hydrogen. As the patient's condition was such that death seemed inevitable, and, owing to the fact that streptococci predominated in the membrane, on the eighth day of the

disease, as a last resort, ten c. c. of antistreptococcus serum was employed. To my surprise, the boy's condition began to improve. The membrane commenced to exfoliate, and three days following, the uvula and left tonsil were entirely cleared of membrane. In a few days, the throat assumed a healthy appearance. The patient has made a good recovery."

An instance occurred, April 16, 1897, in the experience of the health department's laboratory, where the micrococcus of sputum septicemia was concerned in the production of a tonsilitis. Dr. Carlton R. Jewett submitted a culture from the throat of Miss B. The patient was extremely ill with a condition considered to be tonsilar diphtheria. Examination of the culture did not reveal the presence of the Klebs-Löffler bacillus. Reluctant to believe the condition to be other than diphtheria, Dr. Jewett requested that the bacteriologist in person visit the case.

On the following day, Dr. Bissell, under the direction of Dr. Jewett, made several cultural inoculations and also succeeded in obtaining a small portion of the membranous exudate, which, at this time, covered the greater portion of both tonsils and portions of the uvula and naso-pharynx. Examination of the cultures resulted as in the former instance. Examination of the membrane revealed the micrococcus of sputum septicemia in abundance.

The patient died about the tenth day of the disease. Drs. C. G. Stockton, H. R. Hopkins, and Roswell Park had been called in consultation and were unanimous in the statement that as regards the microscopic appearances of the tonsils and the clinical symptoms, the illness could not be distinguished from a severe case of diphtheria. Diphtheritic antitoxin of a reliable make had been administered at the onset of the disease without the slightest improvement. There is no question but that this patient died the result of a toxemia, due to the micrococcus of sputum septicemia, the primary lesions being confined to the tonsils, uvula, and naso-pharynx.

As regards the oidium albicans, many instances have occurred in the experience of the laboratory where the physician has recorded the diagnosis on the culture examination

blank as diphtheria, and the culture revealed an abundance of the "thrush" fungus. The membrane, in these conditions, has been noted as being present on the tonsils, the sides of the cheeks, the uvula, and, in one instance, a cast of the upper portion of the esophagus was submitted for inspection.

The following conclusions can be drawn from the above reported cases:

1. The streptococcus pyogenes and the micrococcus of sputum septicemia can produce membranous anginas, accompanied by physical disturbances sufficient to result in death.

2. The oidium albicans produces pseudo-membranous exudates easily mistaken for a Klebs-Löffler inflammation.

3. The only positive means of determining a Klebs-Löffler infection is by microscopic methods.

4. From the sanitary standpoint, as regards quarantine, anginas due to the streptococcus pyogenes, micrococcus of sputum septicemia, and the oidium albicans, require little consideration.

[SOME COMMENTS.

The two papers above presented are among the more recent and best writings upon the subjects considered, although there is much other literature giving positive evidence of the same kind.

Notwithstanding both papers present conclusions of their own, these will not be rendered any the less emphatic by reason of the following observations:

1. That no case having the appearance of diphtheria can be positively diagnosed as such until the Klebs-Löffler bacillus has been discovered by microscopic examination, which ought to be made in all cases.

2. That without a bacteriological examination which shall determine the true character of the disease, no physician can be certain of the best means of treatment, nor can the health officers be certain as to whether isolation of the patient is necessary or not for the protection of the public.

3. That in a case having all the clinical appearances of malignant diphtheria, the condition may be due wholly to

streptococci infection, in which case anti-diphtheritic serum would be absolutely useless and fatal results might follow, while, had a bacteriological examination been made, the patient might perhaps have been saved by the use of anti-streptococcus serum, or other treatment. These facts may also explain why, in a very small percentage of deaths reported from diphtheria, anti-diphtheritic serum, although given early, produced no remedial effects.

4. That the conclusion that the throats of well persons in a family where diphtheria exists should be examined to determine the extent of infection, seems to be well founded. The same would apply to pupils in a school in which diphtheria makes its appearance.

5. That if bacteriological examinations were made in all cases of suspected diphtheria, a certain percentage would be found to be due to other forms of infection, which would not require the patient or the family to be placed in quarantine.

Dr. L. Emmett Holt of New York says:* "Not only every undoubted case of diphtheria, but every suspected case, should be immediately isolated. Quarantine for the latter should continue until the diagnosis is settled." Speaking of the duration of quarantine, he further adds that the patient is to be considered dangerous while the bacilli persist in the throat. In 605 cases investigated by the New York Health Department, it was found that in 304 the bacilli disappeared by the third day after the membrane was gone. In 301 they persisted for a longer time,—in 176 for seven days; in 64 for twelve days; in 36 for fifteen days; in 12 for twenty-one days; in 4 for twenty-eight days; and in 2 for sixty-three days. Where the culture test cannot be applied, Holt states that quarantine should be continued in mild cases for ten days, and in severe cases for three weeks, after the membrane has disappeared.—I. A. W.]

* Lehigh Valley Medical Magazine, November, 1900.

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